The Refrigeration Service Engineer

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No. 2

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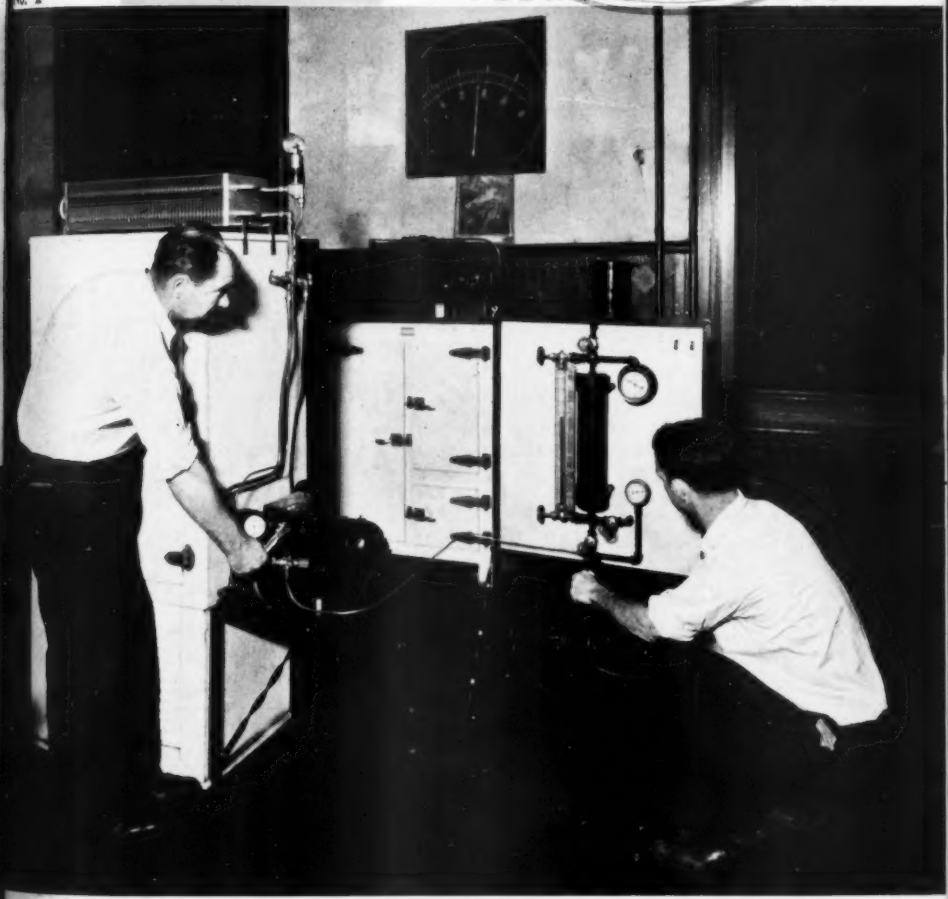

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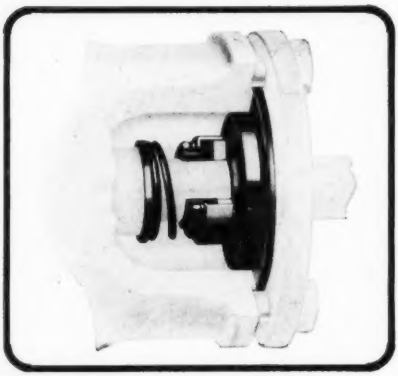

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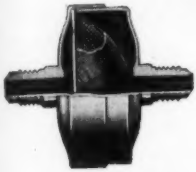

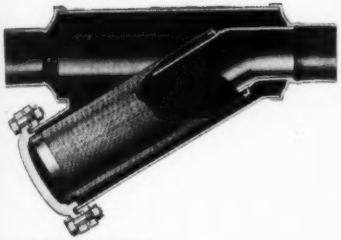

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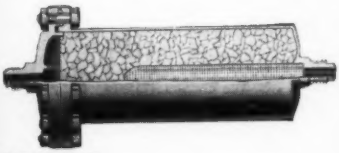

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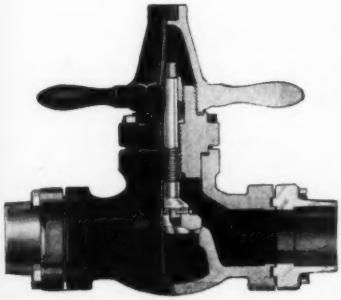

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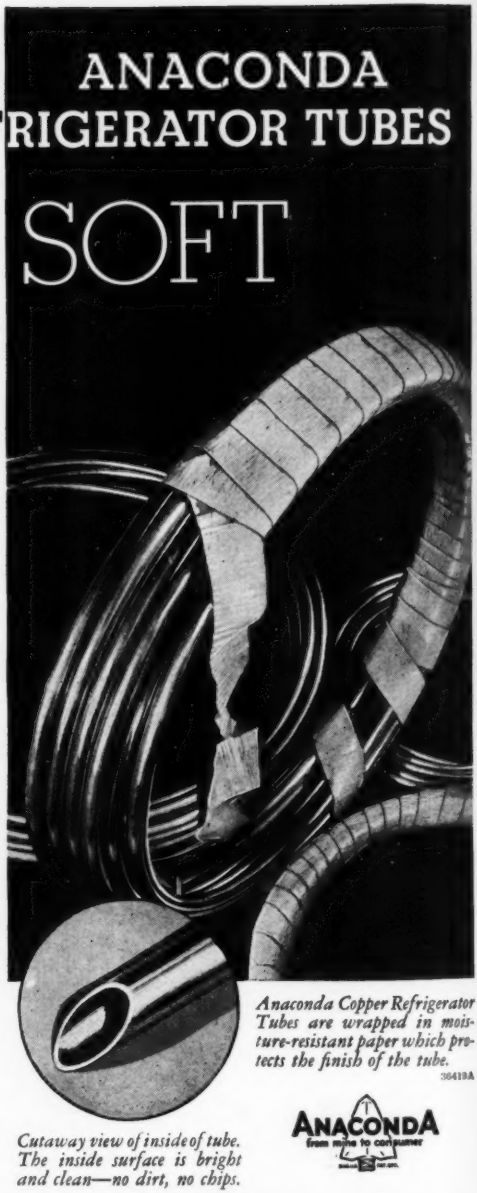

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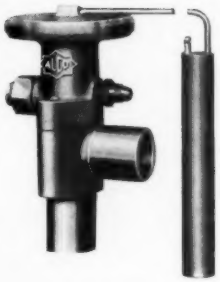
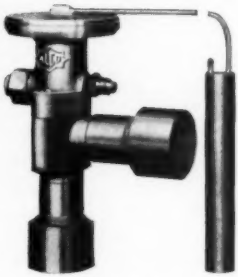


TYPE TIL



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*60 lb.	33	50	64	95
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*Pressure Difference Between Valve Inlet and Outlet.

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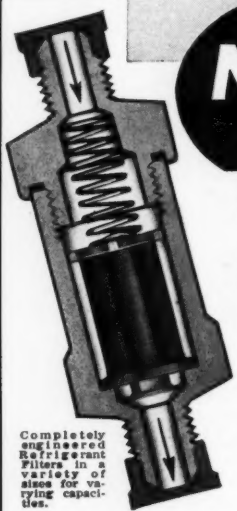

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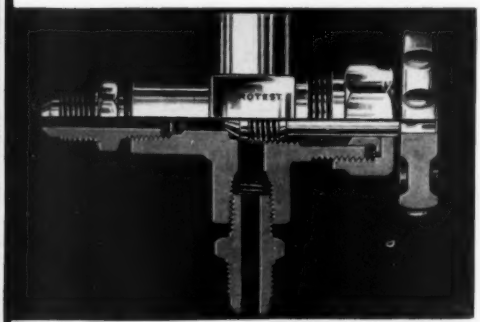

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The REFRIGERATION SERVICE ENGINEER

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VOL. 5 FEBRUARY, 1937 NO. 2

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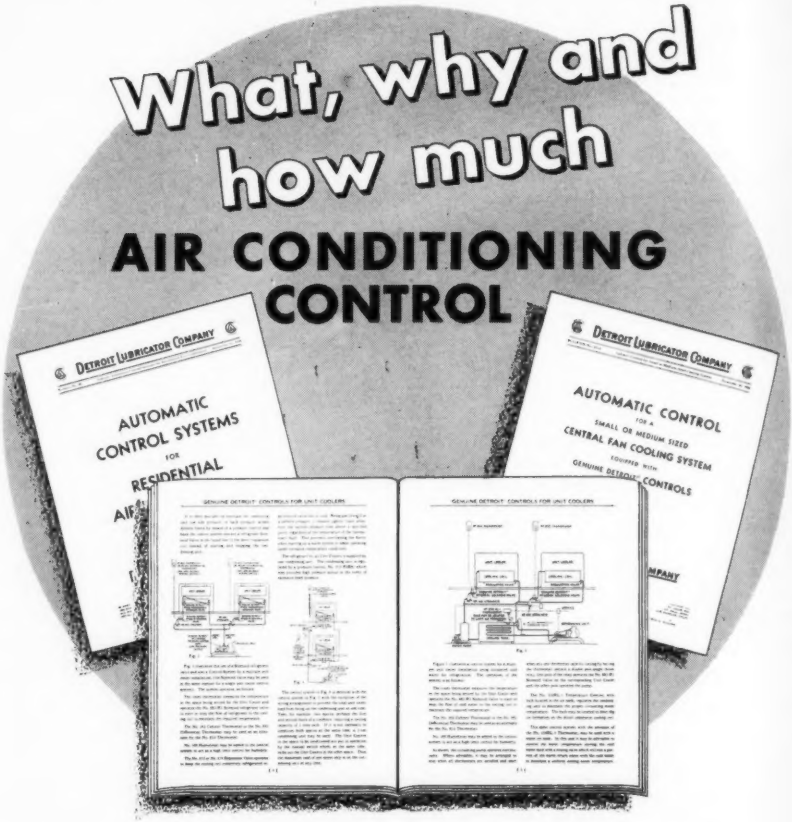
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The Refrigeration Service Engineer

A Monthly Illustrated Journal Devoted to the Interests of the Refrigeration Service Engineer in the Servicing of Domestic and Small Commercial Refrigeration Systems and Oil Burners

OFFICIAL ORGAN REFRIGERATION SERVICE ENGINEERS' SOCIETY

VOL. 5, NO. 2 CHICAGO, FEBRUARY, 1937 $2.00 Per Annum

How to Determine Liquid Line Sizing

Factors Affecting Velocity Through Liquid Line. Chart to Determine Proper Liquid Line Sizes.

By GEORGE H. CLARK, B. S., M. E.

IN conjunction with the article of last month in which we gave a chart for use in determining the proper size of suction lines to be used with the three principal low pressure refrigerants, we are this month giving a chart which should be helpful in determining the proper size of liquid line. This liquid line sizing chart is somewhat simpler than the chart used for sizing suction lines as the evaporation temperature does not affect the volume of the refrigerants to be handled to anywhere near the extent that it does in considering suction line gases.

Thus it will be noted that on this new chart we have one curved line which gives the number of cubic inches per minute of refrigerant which may be passed through lines having the internal diameter as shown by scale *A*. This curve is based on allowing a liquid velocity of 500 feet per minute per inch of diameter for all three refrigerants.

The things which should affect the allowable velocity of course are the viscosity of the fluid being passed through the tube; the diameter of the tube; and the practical limiting velocities, taking into account both viscosity and diameter. If the fluid has a high viscosity as in the case of heavy oil (or, for instance, molasses), the drop in pressure of that fluid through the tube will be very high as compared with the same size of tube and same velocity of flow when using gasoline or some other freely flowing fluid. Likewise, if the tube is of small diameter, the liquid will be confined very closely to the stationary surface of the tube and it is the difference in velocity between the fluid and the tube surface which gives us our friction loss and thereby our drop in pressure. If the tube were moving at the same rate as the refrigerant, of course there would be no friction loss. In a large diameter tube a greater quantity of the refrigerant is located farther from the stationary surface and is thereby not affected to such a great extent in its flow as is the fluid which is in close contact with the stationary tube surface. Eighty-eight feet per minute is a velocity of one mile per hour, so that a velocity of 500 feet per minute is something less than six miles per hour, which we allow as the rate of flow in a one inch diameter tube; and this is surely a low

enough velocity so as to produce very little drop in pressure due to friction. With a ¾ inch diameter, a velocity of approximately four miles per hour is allowed; with a ½ inch, three miles per hour; and with ¼ inch inside diameter, something less than one and one-half miles per hour which is a low enough velocity to keep the drop in pressure through the lines at a minimum.

In thinking of drop in pressure through liquid lines, we must not forget the difference in pressure from one point in the line to another which may be caused by the static head of liquid. By static head we mean the actual difference in level between one point in the line and another point, in feet. For each 2.6 feet of rise, the pressure in a methyl chloride liquid line will be reduced one pound per square inch due to this static head. This point particularly must be taken into account when selecting a refrigerant for use in a refrigerating machine which may be located in the basement of a building and which may be connected to evaporators at a level much higher than the receiver level.

Static Head

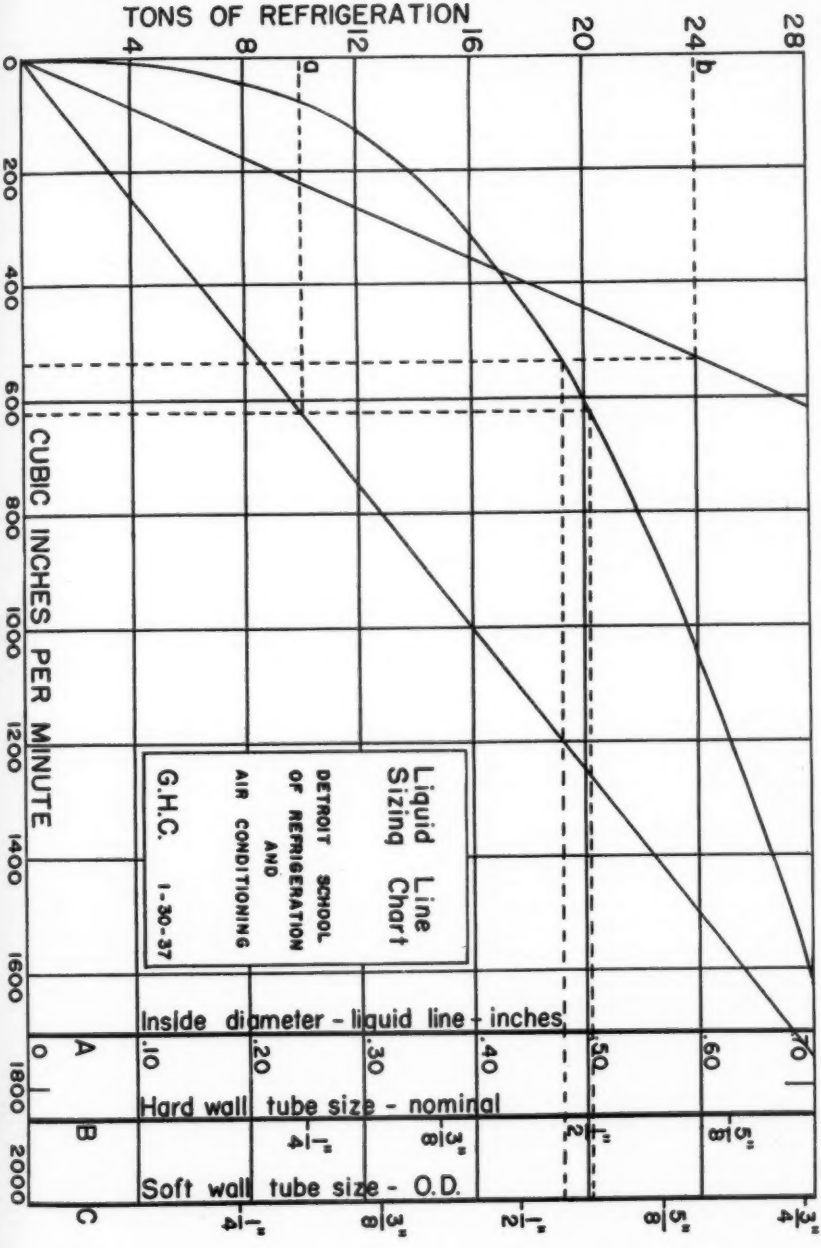
Suppose we are to consider a building in which the top floor is 100 feet above the level of the machine and suppose that we say we want a liquid line at the top floor level to remain at a temperature of 70 degrees and still we must get liquid up in this line.

If we refer to our methyl chloride tables, we find that at 70 degrees the absolute pressure is 73.40 pounds. The pressure at the machine must be greater than this by the difference in pressure caused by the difference in static head between the basement level and the top floor level. In this case the difference in static head will be 100 feet divided by 2.6 feet per pound per square inch, which will be equal to 38 pounds per square inch. 38 pounds per square inch added to 73.4 will give us a pressure of approximately 111 pounds per square inch absolute pressure. If we refer to our same table, we find that at 112 pounds per square inch absolute, we will have a condensing temperature of 96 degrees required for this job.

If we consider sulphur dioxide, we find that a difference in level of 1.7 feet will cause a difference in pressure of one pound per square inch. In the same case, using sulphur dioxide, we find that the difference in pressure due to static head will be 100 feet, divided by 1.7 feet per pound per square inch, which equals approximately 59 pounds per square inch difference in pressure. Referring again to our tables, we find that at the 70 degree temperature we have an absolute pressure of 49.6 pounds with sulphur dioxide and if we add to this the 59 pounds per square inch difference in pressure, we have a total pressure required at our receiver of 108 pounds per square inch absolute. Referring to this absolute pressure, we find that we would require a condensing temperature of 115 degrees with sulphur dioxide. This comparatively high condensing temperature of course indicates a sacrifice in economy of operation as the power required to move heat depends largely on the difference in temperature through which the heat is moved. In other words, if we should evaporate at a temperature of 10 degrees and condense at a temperature of 95 degrees, we are moving our heat through a difference in temperature of 85 degrees. If we evaporate at 10 degrees and condense at 115 degrees, we are moving our heat through a difference in temperature of 105 degrees and we will find that the power consumption is increased in a little greater degree than the ratio 105 divided by 85 indicates.

We may also consider the use of "Freon" (F12) in the same problem. A difference in level of 1.8 feet of "Freon" (F12) will cause a difference in pressure of one pound per square inch so that dividing 100 by 1.8, we get a difference in pressure of 55 pounds per square inch. Referring to our "Freon" (F12) chart, we find that the absolute pressure for "Freon" (F12) at 70 degrees is approximately 85 pounds. Adding to this our 55 pounds difference in pressure, we get a total condensing pressure of 140 pounds absolute required. At 140 pounds absolute pressure, a condensing temperature of approximately 105 degrees is noted.

So, to obtain the liquid in a 70 degree liquid line at a level 100 feet above the receiver level, it will be necessary to condense at 96 degrees with methyl chloride, 115 degrees with sulphur dioxide, and 105 degrees with "Freon" (F12). This comparison indicates that where a great difference in level


TONS OF REFRIGERATION
4
8
12
16
20
24
28
a
b
0
200
400
600
800
1000
1200
1400
1600
1800
2000
CUBIC INCHES PER MINUTE
Liquid Sizing Line Chart
DETROIT SCHOOL OF REFRIGERATION AND AIR CONDITIONING
G.H.C. 1-30-37
Inside diameter - liquid line - inches
A
.10
.20
.30
.40
.50
.60
.70
Hard wall tube size - nominal
B
1/4"
3/8"
1/2"
5/8"
Soft wall tube size - O.D.
C
1/4"
3/8"
1/2"
5/8"
3/4"

exists between the condensing unit and the evaporators, methyl chloride should be the first choice of refrigerant from this standpoint, "Freon" second, and sulphur dioxide third.

These differences in pressure are strictly due to static head loss alone and any additional drop in pressure due to friction through the lines must be added to the static loss. With the accompanying liquid line sizing chart, the friction loss will be practically negligible in lines up to 100 feet or possibly 200 feet long. The use of this chart is very similar to the use of the suction line sizing chart as shown in the January issue.

For instance, if we want to find what size liquid line to use for a "Freon" (F12) condensing unit of ten tons capacity, we follow a dotted line from point *"a"* at the left side of our chart to the straight line labeled "Freon" and if we drop straight down from the intersection of the "Freon" and 10 ton capacity lines, we find that approximately 620 cubic inches per minute of liquid "Freon" will have to be circulated to produce this 10 tons of refrigeration; and if we follow this 620 cubic inch line up to the flow curve and then proceed from this point horizontally to the right on scale *A*, we find an internal liquid line diameter of .505 inch required. This is so close to the ½ inch nominal tube size that that would be the size line specified as shown by scale *B*, unless the length of the line is excessive. On scale *C* we find that for soft wall tubing we come between the ½ inch and ⅝ inch O.D. size so that a ⅝ inch O.D. soft wall tube would be specified.

This liquid line size is based on an 80-degree liquid temperature entering the valve, the refrigerant leaving the evaporator saturated, and 40 degree evaporation. If we reduced our evaporation temperature to 20 degrees, we find that the number of cubic inches per minute of refrigerant to be handled would be only five per cent greater and this five per cent will not be sufficient to require any change in size as far as liquid line is concerned.

If we consider a 24 ton methyl chloride system as shown by the dotted line starting at the left hand of the chart at point *"b,"* we proceed to the sulphur dioxide-methyl chloride line and downward to the bottom of the chart where we have indicated a flow of 540 cubic inches of liquid methyl chloride per minute. Where this vertical line crosses our flow curve, we proceed horizontally to the right, where we have indicated an inside diameter requirement of .48 inch; so that a ½ inch nominal tube size or a ⅝ inch O.D. tube would be specified.

The same size liquid line may also be specified for sulphur dioxide. The actual difference in cubic inches of sulphur dioxide and methyl chloride which should be circulated to produce the same amount of refrigeration is only five per cent so that this small difference need not be considered in using a chart of this kind.

Where some drop in pressure is allowable, it is possible that a tube one size smaller than those indicated may cause no appreciable losses. However, in considering long tubing runs, the sizes of line as indicated by this chart are to be regarded as safe sizes.

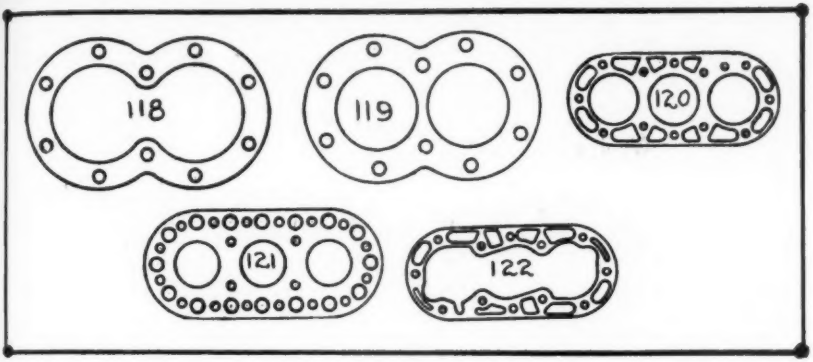
S S S

EDITOR, REFRIGERATION SERVICE ENGINEER

I read the R.S.E. every month with growing interest, and would not be without it. I now have two years' issues, with the handsome binders, but, say, the infant magazine is growing too big for its clothes. You pack each issue so full of news and helpful advertising, and put out so many extra pages that not only do I get more than my money's worth, but I can't get the year's issues in the binders without ripping off not only the covers, but any outside pages of advertising I can, without actually sacrificing news. You've got to do something about this, Mr. Editor, but don't start cutting down or out. Either you can make the binder larger, or arrange the advertising so that at least the outside pages can be removed, if necessary. But I prefer the larger binder, for I want the ads for future reference.

(Signed) WALTER G. HARVEY.

EDITOR'S NOTE: We've anticipated your requirements, Mr. Harvey. The new R. S. E. binder is made to accommodate twelve issues of the enlarged size. Please do not sacrifice the advertising pages. They are a most important part of a trade journal and oftentimes invaluable for future reference.



REFER TO GASKET INFORMATION TABLES 1 TO 10.

Selecting and Ordering GASKETS

There are thousands of them. Illustrations on following pages with reference numbers will be helpful in securing the right one.

By L. K. WRIGHT, *Mem. A. S. R. E.*

• Gasket information has been arranged in a convenient form, which can be cut out and kept in a leather binder for ready reference. This binder can be secured from The Refrigeration Service Engineer and will accommodate other service information to be published from time to time. Binders are one dollar each.—*Editor.*

GASKETS—there are thousands of them, as any service manager or service man knows. To obtain replacement gaskets the original manufacturer's part number must be known and it is toward this end that the following list and illustrations were compiled.

The gasket list has been divided into main groups, each covering a particular manufacturer. Each group in turn has been so prepared that the finger can be placed upon the desired gasket number in the shortest possible time.

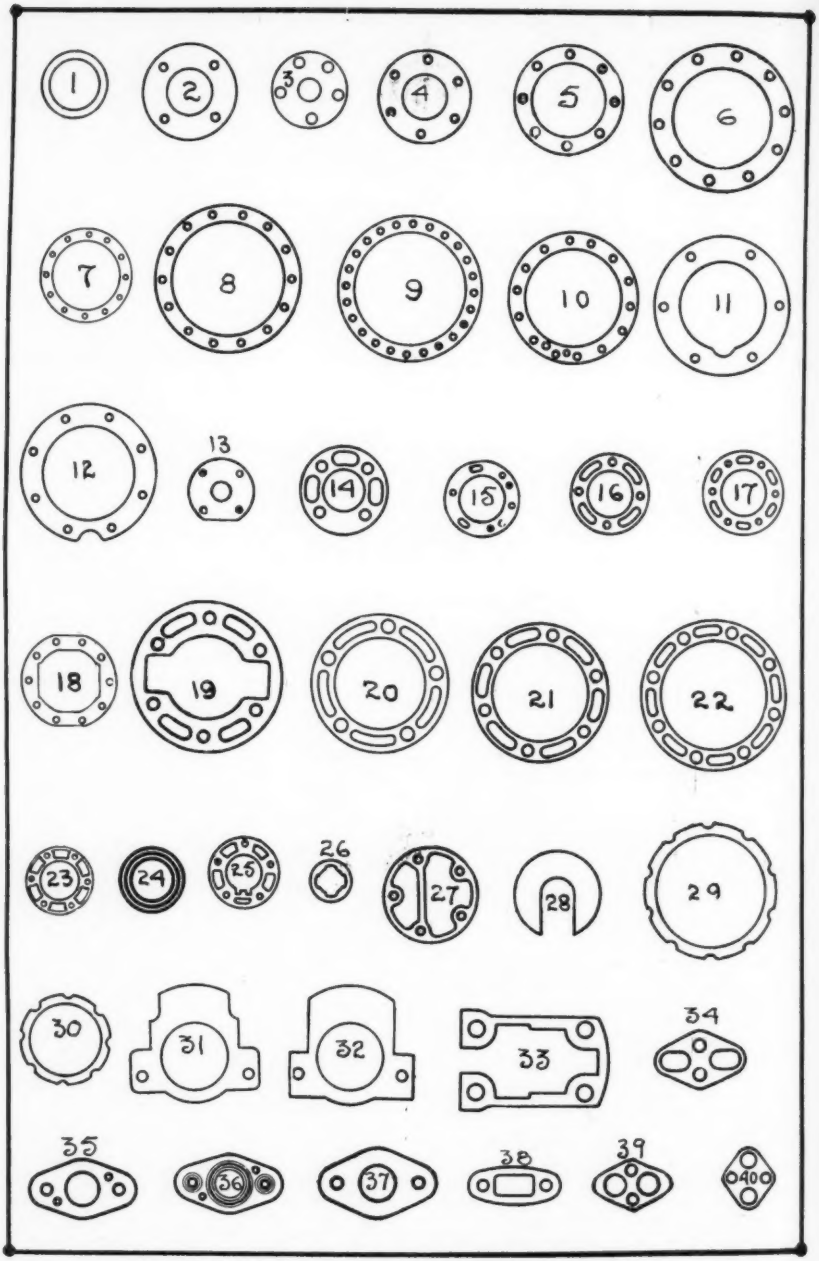
Gasket Material

Asbestos and lead are the two materials which find wide use in the manufacture of gaskets. Lead is a stable metal, unaffected by any of the refrigerants or lubricants used in refrigeration apparatus. Asbestos, in itself, is also entirely stable and just as unaffected as lead so far as action of refrigerants or oils is concerned, but the binders used in forming it into sheets are solvent in some cases.

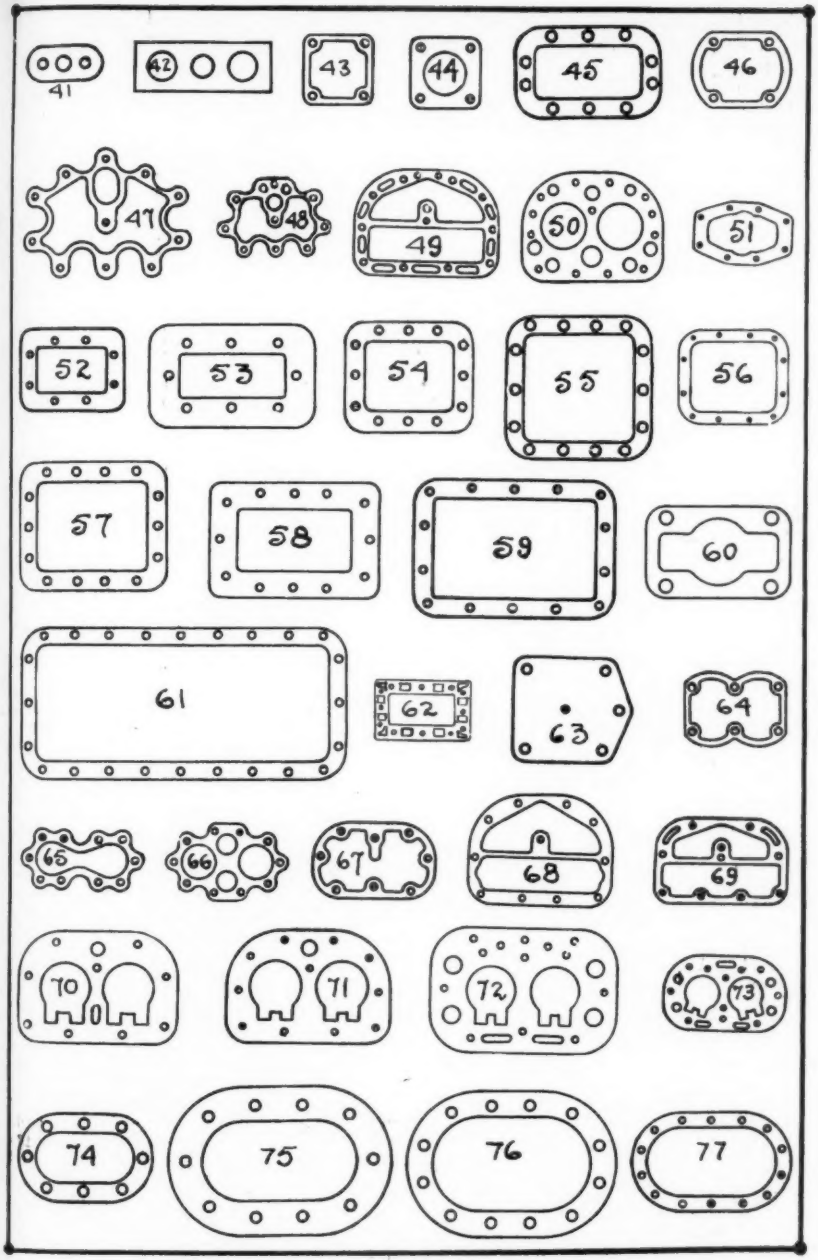
Lead can be employed in any and all cases. Asbestos is limited to such use where its binder will not be dissolved and in replacement cases lead can be substituted for asbestos. The reverse should not be attempted, that is, the use of an asbestos gasket where lead is indicated.

It will be observed in many cases on the list that R. M. metal is given as the gasket material. This is an alloy of lead,

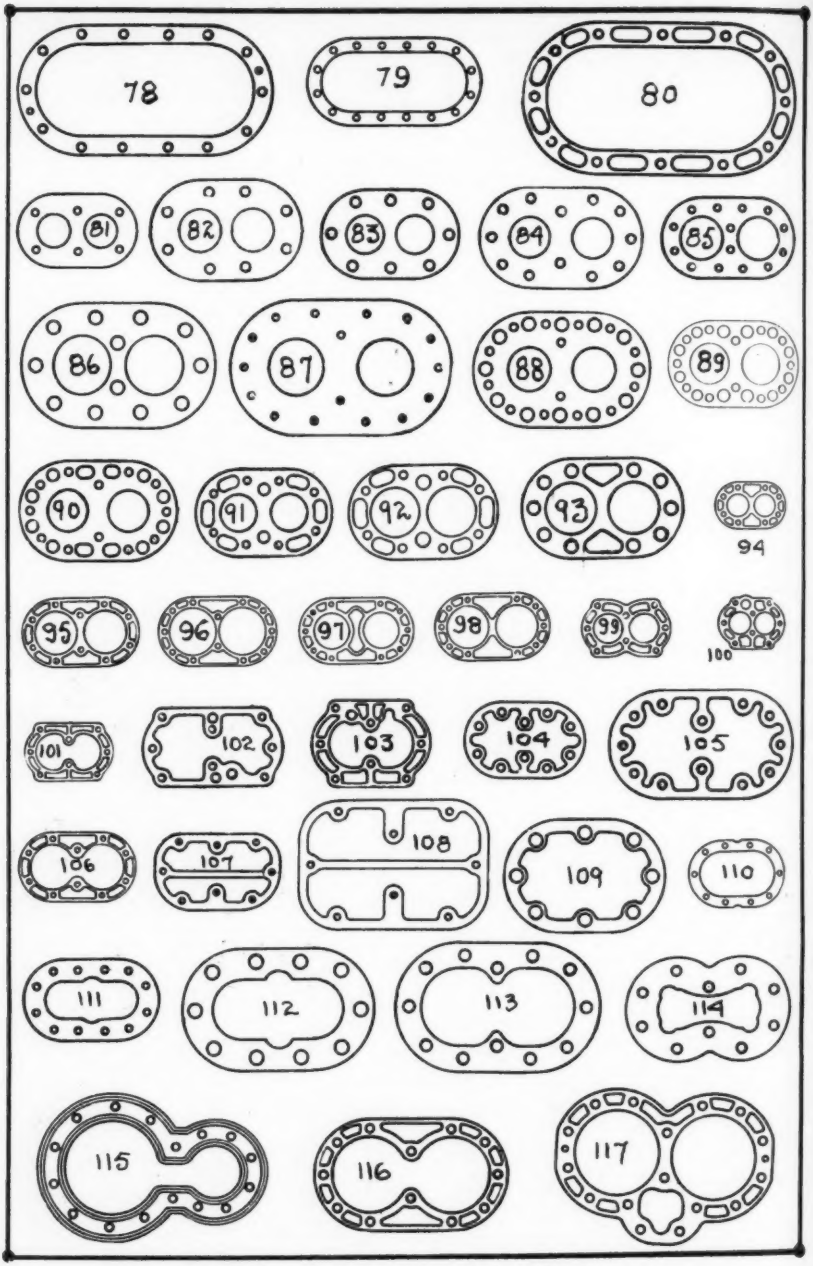
(Continued on page 27)



TYPES OF GASKETS. REFER TO GASKET TABLES 1 TO 10.



TYPES OF GASKETS. REFER TO GASKET TABLES 1 TO 10.



TYPES OF GASKETS. REFER TO GASKET TABLES 1 TO 10.

GASKET INFORMATION—1

For Type Numbers Refer to Charts

For Frigidaire Units

CYLINDER TO CRANKCASE GASKETS

Manufacturers No.	Type No.	Material	Compressor Model
97007	18	Asbestos	A, AW, B, BP, G, S, SAE, SAU, SC, AA-120, A-120-L, A-125, A-125-E, A-125-L, A-125-P, AB-133, FA-125-P, FAAS-120 FAS-125, FAS-125-E, FABS-133.
98307	56	Asbestos	K, L, N, O, P, Y.
100261	51	Asbestos	E, EAE, EF, EFE, EW, EWO, F, FE, FS, T5, TL.
100726	110	Asbestos	C, D, R, U, A-4100, A-5150, FA-4150, FW-4100, FW-6200-S, FW-6300, W-475, W-5100, W-6150.
621538	...	Asbestos	A-233, A-233-E, A-375, FA-275, FA-3100, FAS-233, FAS-233-E, FW-250, FW-375, FWS-233, W-233.
624375	7	Asbestos	AA-120, A-120-L, A-125, A-125-E, A-125-L, AB-133, FA-125-E, FA-125-P, H-163, H-203, H-253, H-333.

SYLPHON OR SEAL GASKETS

97016	1	Lead	A, AW, B, BP, G, K, L, N, O, P, S, SAE, SAU, SC, AA-120, A-120-L, A-125, A-125-E, A-125-L, A-125-P, A-233, A-233-E, A-375, AB-133, F1B, F1BE, F1BP, F1C, FA-125-E, FA-125-P, FA-275, FA-3100, FAAS-120, FAS-125, FAS-233, FAS-233-E, FABS-133, FW-250, FW-375, FWS-233, H-163, H-164, H-165, H-204, H-205, H-254, H-255, H-334, H-335, W-233, W-350, 1A, 1AA, 1AW, 1B, 1BE, 1BW, 1C.
100723	1	Lead	C, D, R, U, 2C, 2CE, 3D, 4E, 5F, 6G, 6O, A-4100, A-5150, F2CE, F2D, F3E, F4F, F5G, F6O, FA-4150, FW2D, FW3E, FW4F, FW5G, FW6O, FW6H, FW6J, FW-4100, FW-6200-S, FW-6300, W2C, W3D, W4E, W5F, W6G, W-475, W-5100, W-6150.
619307	1	Lead	E, EAE, EF, EFE, EW, EWO, F, FE, FS, T5, TL.
635875	1	Lead	FW1C

VALVE PLATE GASKETS

99084	23	R.M. Metal, .015"	S (Single Cylinder).
99085	23	R.M. Metal, .005"	S (Single Cylinder).
99086	23	R.M. Metal, .010"	S (Single Cylinder).
99087	99	R.M. Metal, .010"	AA-120, A-120-L, A-125, A-125-E, A-125-L, A-125-P, AB-133, FA-125-P, FAAS-120, FAS-125, FAS-125-E, FABS-133.
99088	99	R.M. Metal, .006"	A, AW, B, BP, G, S, SAE, SAU, SC.
99091	95	R.M. Metal, .006"	N, O, R, U, A-233, A-233-E, A-375, A-4100, FA-275, FA-3100, FA-4150, FAS-233, FAS-233-E, FW-250, FW-375, FW-4100, FWS-233, W-233, W-350, W-475.
99092	95	R.M. Metal, .010"	K, L, N, O, P, R, U, Y, A-233, A-233-E, A-375, A-4100, FA-275, FA-3100, FA-4150, FAS-233, FAS-233-E, FW-250, FW-375, FW-4100, FWS-233, W-233, W-350, W-475.
100728, 634173	96	R.M. Metal, .010"	C, D, A-5150, FW-6200-S, FW-6300, W-5100, W-6150.
100859	20	R.M. Metal	E, EAE, EF, EFE, EW, EWO, F, FE, FS, T5, TL.
619709	95	R.M. Metal	K, L, P, Y.
621608	95	R.M. Metal, .010"	A-233, A-233-E, FA-275, FAS-233, FAS-233-E, FW-250, FWS-233, W-233, W-350

GASKET INFORMATION—2

For Type Numbers Refer to Charts

Frigidaire Valve Plate Gaskets—Continued

Manufacturers No.	Type No.	Material	Compressor Model
624356	100	R.M. Metal.....	A-120-L, A-125, A-125-E, A-125-L, AB-133, FA-125-E, FA-125-P, (Used with one piece body). 1A, 1AA, 1AW, 1B, 1BE, 1BW, 1C, AA-120, F1B, F1BE, F1BP, F1C, F1CC, FW1C, H-163, H-164, H-185, H-203, H-204, H-205, H-254, H-255, H-334, H-335.
634838	97	R.M. Metal.....	4E, F4F, FW4F, W4E.
634839	98	R.M. Metal.....	5F, 6G, 6O, F5G, F6O, FW5G, FW6H, FW6J, FW6O, W5F, W6G.
635009	94	R.M. Metal.....	2C, 2CE, 3D, F2CE, F2D, F3E, FW2D, FW3E.
		CYLINDER HEAD GASKETS	
99089	101	R.M. Metal, .006"	A, AW, B, BP, G, S, SAE, SAU, SC, AA-120, A-120-L, A-125, A-125-E, A-125-L, A-125-P, AB-133, FA-125-E, FA-125-P, FAAS-120, FAS-125, FABS-133.
99090	106	R.M. Metal, .010"	K, L, N, O, P, R, U, Y, A-233, A-233-E, A-375, A-4100, FA-275, FA-3100, FA-4150, FAS-233, FAS-233-E, FW-233, FW-250, FW-375, FW-4100, W-233, W-350, W-475.
100729,634173	116	R.M. Metal, .010"	C, D, A-5150, W-5100.
100857	20	R.M. Metal.....	E, EAE, EF, EFE, EW, EWO, F, FE, FS, T5, TL.
624358	103	R.M. Metal.....	1AA, H-163, H-164, H-165, H-203, H-204, H-205, H-253, H-254, H-255, H-333, H-334, H-335.
634616	102	R.M. Metal.....	1A, 1AW, 1B, 1BE, 1BW, 1C, AA-120, A-120-L, A-125, A-125-E, A-125-L, AB-133, F1B, F1BE, F1BP, F1C, F1CC, FA-125-E, FA-125-P, FW1C.
634844	105	R.M. Metal.....	4E, 5F, 6G, 6O, F4F, F5G, F6O, FW4F, FW5G, FW6H, FW6J, FW6O, W4E, W5F, W6G.
635010	104	R.M. Metal.....	2C, 2CE, 3D, F2CE, F2D, F3E, FW2D, FW3E, W2C, W3D.
640097	117	R.M. Metal.....	1935, 5 H.P.
		END PLATE GASKETS	
100724	7	Asbestos.....	C, D, U, A-4100, A-5150, FA-4150, FW-4100, FW-6200-S, FW-6300, W-5100, W-6150.
100725	1	Lead.....	C, D, A-5150, W-5100.
621537	5	Asbestos.....	A-233, A-233-E, A-375, FA-275, FA-3100, FAS-233, FAS-233-E, FW-250, FW-375, FWS-233, W-233, W-350.
		BOTTOM PLATE GASKETS	
624375	7	Asbestos.....	1A, 1AA, 1AW, 1B, 1BE, 1BW, 1C, F1B, F1BE, F1BP, F1C, F1CC, FW1C, H-164, H-165, H-204, H-205, H-254, H-255, H-344, H-335.
635033	8	Asbestos.....	4E, 5F, 6G, 6O, F4F, F5G, F6O, FW4F, FW5G, FW6H, FW6J, FW6O, W4E, W5F, W6G.
635036	7	Asbestos.....	2C, 2CE, 3D, F2CE, F2D, F3E, FW2D, FW3E, W2C, W3D.
		TWO-WAY VALVE GASKETS	
101278	36	Steel.....	Small (1⅛" bolt centers) Used between 2 Lead Gaskets.
101279	35	Lead.....	Small (1⅛" bolt centers).
633810	37	Lead.....	Large (1¾" bolt centers).

GASKET INFORMATION—3

For Type Numbers Refer to Charts

For Frigidaire Units

Manufacturers No.	Type No.	Material	Compressor Model
END COVER SCREW GASKETS			
635032	7	Asbestos.....	W4E, W5F.
635090	26	Copper.....	2C, 2CE, 3D, 4E, 5F, 6G, 6O, F2CE, F2D, F3E, F4F, F5G, F6O, FW2D, FW4F, FW5G, FW6H, FW6J, FW6O, W2C, W3D, W4E, W5F, W6G.
TANK RING GASKETS			
97559	5	Special.....	For Ice Cream Cabinet.
617621	78	Special.....	For 4 Hole Portable Ice Cream Cabinet.
MISCELLANEOUS GASKETS FOR FRIGIDAIRE UNITS			
42065	1	R.M. Metal.....	Suction Valve Gasket for all float valves.
42090	1	Lead.....	Float Valve Header Gasket.
42090	1	R.M. Metal.....	Float Valve Header Gasket.
97009	1	Copper.....	Valve Mounting Screw Gasket for all models.
97316	24	Copper, Asbestos.	Water Strainer Plug Gasket for Model L, N, Y.
101110	1	Lead.....	Float Valve Strainer Plug Gasket.
614423	63	Diaphragm Cloth.	Diaphragm Control Gasket.
616365	1	R.M. Metal.....	Expansion Valve Cover Gasket.
617148	42	Special.....	Water Cooled Flapper Valve Flange Gasket for Model C, 4, A-4100, FW-6200-S, FW-6300, W-475, W-6150. Valve Plate Manifold Gasket for Model W4E, W5F, W6G.
620228	42	Special.....	Manifold Gasket for Model U, FW-250, FW-375, FWS-233, W-233, W-350, W-475, W-5150.
624357	1	Copper.....	Compressor and Condenser Valve Seal Plug Gasket for Model H-163, H-203, H-233, H-253.
624360	1	Copper.....	Shaft Plug Gasket for Model 1A, 1AA, 1AW, 1B, 1BE, 1BW, 1C, AA-120, A-120-L, A-125, A-125-E, A-125-L, AB-133, F1B, F1BE, F1BP, F1C, F1CC, FA-125-E, FA-125-P, FW1C, H-163, H-164, H-203, H-204, H-253, H-254, H-333, H-334.
624364	26	Copper.....	Valve Mounting Screw Gasket for Model 1A, 1AA, 1AW, 1B, 1BE, 1BW, AA-120, A-120-L, A-125, A-125-E, A-125-L, AB-133, F1B, F1BC, F1BE, F1C, F1CC, FA-125-E, FA-125-P, FW1C, H-163, H-164, H-203, H-204, H-253, H-254, H-333, H-334.
633365	1	Lead.....	Body Gasket.
634415	1	R.M. Metal.....	Crankcase Valve Gasket.
634611	1	R.M. Metal.....	Seal Plug Gasket for Water Valve on 1934, 5 H.P. Unit.
635066	5	Asbestos.....	End Cover Gasket for Model 2C, 2CE, 3D, F2CE, F2D, F3E, FW3E, W2C, W3O.
640096	10	Asbestos.....	Bearing Plate Gasket for 1934, 5 H.P. Unit.
640476	1	Rubber.....	Gasket for Sight Glass.
640477	1	Lead.....	Gasket for Sight Glass.
640514	1	Copper.....	Suction Valve Packing Gasket for Model 6G, 6O, F4F, F5G, F6O, FW4F, FW5G, FW6H, FW6J, FW6O, W5F, W6G.
640515	1	Rubber.....	Suction Gasket for Model 5F, 6G, 6O, F4F, F5G, F6O, FW4F, FW5G, FW6J, W5F, W6G.

GASKET INFORMATION—4

For Type Numbers Refer to Charts

For Kelvinator Units

CYLINDER HEAD GASKETS

Manufacturers No.	Type No.	Material	Compressor Model
3096	114	Asbestos	F, S.
3336	4	Asbestos	LB.
3337	118	Asbestos	BB, WB, Z3 on.
3630	1	R.M. Metal	L, LM.
5067	1	Lead	R10, R30, RM35, WR20, WR40, WR45, WR55.
5067	1	R.M. Metal	R10, R30, RM35, WR20, WR40, WR45, WR55.
9038	46	Asbestos	C from Ser. No. 8975.
11007	68	Asbestos	R11, R31, RB, RD, RM36, WR21, WR41, WR46, WR56.
11269	1	Asbestos	L from Ser. No. 18275.
13515	49	R.M. Metal	R11, R31, RB, RD, RM36, WR21, WR41, WR46, WR56.
13604	48	R.M. Metal	FB.
13611	69	Asbestos	FB.
13624	47	R.M. Metal	RB, RD.
13663	27	R.M. Metal	A, CA.
13669	107	R.M. Metal	A, B, CB.
14636	67	Asbestos	CB.
19030	4	Asbestos	J, M (Midget).
20251	108	R.M. Metal	
21245	1	Asbestos	C to Ser. No. 8975, L.
21378	66		
21379	65		

COMPRESSOR BASE GASKETS

3333	45	Asbestos	LB.
3334	55	Asbestos	BB, F, FB, R, RB, RD, RM, WB, WR.
3622	57	Asbestos	CB, L.
3623	54	Asbestos	C10 to C13, CA, CM12.
9035	54	Asbestos	S.
11208	61	Asbestos	RD.
12515	58	Asbestos	M (Midget).
19035	53	Asbestos	J.

DISCHARGE VALVE PLATE GASKETS

3171	4	Asbestos	LB.
3336	4	Asbestos	LB.
3338	119	Asbestos	BB, WB.
9030	119	Asbestos	D, F, S.
9041	2	Asbestos	C from Ser. No. 8975.
11006	50	Asbestos	R11, R31, RB, RD, RM36, WR21, WR41, WR46, WR56.
11270	81	Asbestos	L from Ser. No. 18275.
13516	50	R. M. Metal	R11, R31, RB, RD, RM36, WR21, WR41, WR46, WR56.
13612	70	Asbestos	FB.
13664	25	R.M. Metal	A, CA.
13679	73	R.M. Metal	A, B, CB.
15010	71	Asbestos	R, RB, RD, Q.
20252	72	R.M. Metal	
21244	1	Asbestos	C to Ser. No. 8975.
505163	4	Asbestos (.003")	I, N.
505164	4	Asbestos (.010")	I, N.

CRANKCASE COVER GASKETS

3325	6	Asbestos	BB, LB, R, RB, RD, RM, WB, WR.
18804	12	Asbestos	C, CA, CB, D2, F, FB, J, S.

SYLPHON OR SEAL GASKETS

3332	1	Asbestos	BB, LB, R, RB, RD, WB, WR.
9111	1	Asbestos	C, D, F, J, L, M, S.
49507		R.M. Metal	BB, C, D, F, J, L, LB, M, RB, RD, S, WB, WR.

GASKET INFORMATION—5

For Type Numbers Refer to Charts

For Kelvinator Units

CRANKSHAFT THRUST PLUG GASKETS

Manufacturers No.	Type No.	Material	Compressor Model
3359	1	Asbestos	BB, LB, WB.
3372	1	R.M. Metal	F, G, 12 on, S12 on.
3643	1	Lead	C10 to C13, CM12, L.
4738	1	Lead	Q, R, RB, RD, RM, WR from Ser. No 237560.
12518	1	Lead	M (Midget).
13617	16	Asbestos	CA, CB, FB.

SUCTION PORT PLATE GASKETS

9112	2	Asbestos	D.
13513	17	R.M. Metal	R11, R31, RM36, WR21, WR41, WR46, WR56.
13615	43	Asbestos	CA, CB, FB.

DRIVE GEAR CASE COVER GASKETS

505021	5	Special	I, N, Z.
505023	2	Special	I, N, Z.

OIL PLUG GASKETS

12518	1	Lead	BB, F1 to F9, J, LB, M, S, WB (For Kelvinator Part No. 12512 Oil Plug).
13030	24	Copper, Asbestos.	C, F10 on, J, L, R, S (For Kelvinator Part No. 13029 Oil Plug).

THERMOSTAT SWITCH GASKETS

2153	1	Brass	Switch Trip Spring Washer.
2154	33	Asbestos	Switch Cover Gasket.
2155	32	Asbestos	Gasket.
2191	31	Asbestos	Switch Box Gasket.

EXPANSION VALVE GASKETS

2044	1	Lead	Inlet Fitting	C1, C2	2070, 4374.
2046	1	Lead	Valve Spring Plug	C1, C2, C3, C4, C5, C6.	2070, 4374, 11718, 13130, 14696, 14876.
3073	5	Asbestos	Cover	B1, B2, B3, B4, B5	3135, 6000, 6012, 6040, 6200.
6007	1	Lead	Valve Seat	B2, B3, B4.	6000, 6012, 6040.
6034	24	Copper, Asbestos	Cover Plug	B2, B3, B4.	6000, 6012, 6040.
6050	24	Copper, Asbestos	Strainer Plug	B1, B2, B3, B4	3135, 6000, 6012, 6040.
6206	1	R.M. Metal	Valve Seat	B5	6200.
7003	37	Asbestos	Valve Pad (1⅝" Bolt Centers)	All Flange Type.	
7003	37	Lead	Valve Pad (1⅝" Bolt Centers).	All Flange Type.	
9051	24	Copper, Asbestos	Body Plug	B1, B2, B3, B4, B5	3135, 6000, 6012, 6040, 6200.

FLOAT VALVE GASKETS

					For Float Valve Part No.
			Type Gasket	Model	
2374	1	Lead	Strainer	C2	4390.
4381	1	Lead	Header	C2	4390.
6111	1	Lead	Header	B1, B2, B3.	2393, 6118, 6139.
11851	1	Copper Asbestos	Valve Cage Peanut Float	C2	4390.

WATER VALVE GASKETS

					For Water Valve Part No.
			Type Gasket	Model	
2658	24	Copper, Asbestos	Valve Seat	B1, B2	2650, 10022.
2659	24	Copper, Asbestos	Strainer Plug	B1, B2	2650, 10022.
2660	24	Copper, Asbestos	Adjusting Screw Plug	B1, B2	2650, 10022.
15383	24	Copper, Asbestos	Cushioning Piston Guide	C	15370.

GASKET INFORMATION—6

For Type Numbers Refer to Charts

For Kelvinator Units

Manufacturers No.	Type No.	Material	Type Gasket	For Service Valve Part No.
			SERVICE VALVE GASKETS	
2044	1	Lead	Fitting and Strainer Assembly	3046, 4395, 4396.
2670	40	Asbestos	Suction and Liquid	3046.
4382	34	Asbestos	Suction and Liquid	4395, 4396.
7003	37	Asbestos	Suction (1⅝" Bolt Centers).	
7003	37	Lead	Suction (1⅝" Bolt Centers).	
7017	37	Asbestos	Valve Seat	7025, 7026.
7019	1	Copper	Suction Adapter	Compressor Model R10, R30, WR20, WR40, WR45, WR55.
7107	37	Asbestos		BB, LB, WB.
19538	24	Copper, Asbestos	1½" Diameter.	
			MISCELLANEOUS GASKETS	
				Compressor Model
3335	1	Copper	Cylinder Block Screw Gasket for Model Z3 on.	
5177	1	R.M. Metal	Cylinder Head Refrigerant and Water Fitting Bushing Gasket for Model BB, F, R, WB.	
7018	1	Copper	Liquid Line Strainer Gasket for Model F10, F11, F30, F35, F37, FM55, WF20, WF21, WF40, WF47, WF65. Refrigerant Line Gasket for Model R10, R11, R30, RM36, WR20, WR21, WR40.	
7107	37	Asbestos	High Pressure Control Line Adapter and Suction Service Valve Gasket for Model BB, LB, WB.	
9023	1	Copper	Crankcase Cover Screw Gasket for Model C, D, F, G, L, S. Cylinder Block Screw Gasket for Model ES on. Cylinder Head Screw Gasket for Model G1 to G6, S1 to S6. Base Screw Gasket for Model G1 to G11, G13, S1 to S11.	
17003	1	Lead	Charging Fitting Gasket.	
18070	24	Copper, Asbestos		
506132	6	Paper	Cylinder Block Gasket for Model I.	

For Copeland Units

			CYLINDER HEAD GASKETS
147	4	Asbestos	1A, AM, AM200, E1, E2, I, IC1, IC2, IL, Q, QG.
248	118	Asbestos	2, 2L, IC3, IC4, R, RG, RW.
7072	119	Asbestos	W, WA, X, XA, XAG.
9520	122	R.M. Metal	T.
			CYLINDER BASE PLATE GASKETS
102	52	Asbestos	1A, AM, AM200, E1, E2, I, IC1, IC2, IL, Q, QG.
202	45	Asbestos	2, 2L, IC3, IC4, R, RG, RW.
1534	59	Asbestos	T, W, WA, X, XA, XAG.
			CRANKCASE COVER GASKETS
111	5	Asbestos	1A, 2, 2L, AM, AM200, E1, E2, I, IC1, IC2, IC3, IC4, IL, Q, QG, R, RG, RW.
1518	5	Asbestos	T, W, WA, X, XA, XAG.
9527	80	R.M. Metal .010".	T.
9528	80	R.M. Metal .015".	T.

GASKET INFORMATION—7

For Type Numbers Refer to Charts

For Copeland Units

DISCHARGE VALVE PLATE GASKETS

147	4	Asbestos.....	1A, AM, AM200, E1, E2, I, IC1, IC2 IL, Q, QG.
247	119	Asbestos.....	2, 2L, IC3, IC4, R, RG, RW.
9524	120	R.M. Metal .010".	T.
9525	120	R.M. Metal .015".	T.

SEAL COVER GASKETS

118	4	Asbestos.....	1A, 2, 2L, AM, AM200, E1, E2, I, IC1, IC2, IC3, IC4, IL, Q, QG, R, RG, RW.
1521	4	Asbestos.....	T, W, WA, X, XA, XAG.

SEAL BEARING GASKETS

1559	1	Lead.....	T.
6957	1	Lead.....	
7754	1	Lead.....	1A, I, IL, Q, QG.

SHUTOFF VALVE GASKETS

1008	37	Asbestos.....	1¾" Bolt Centers.
1013	1	Lead.....	Used under grooved flange on shutoff valves and expansion valves.
7556	37	Asbestos.....	W, WA, X, XA, XAG.

MISCELLANEOUS GASKETS

3642	1	Lead.....	Expansion Valve Filter Gasket.
8697	5	Asbestos.....	Expansion Coil Header Ring Gasket.
8953-1		Lead.....	Drum Cover Gasket for Model C Water Cooler.
9523		Rubber.....	Cylinder Head Cover Gasket for Model T.

For Servel Units

COMPRESSOR HEAD GASKETS

28-6	121	R.M. Metal.....	200A, 200AW.
28-8	91	R.M. Metal.....	30AW, 40AW, 30CW, 30DW, 30EW.
28-9	90	R.M. Metal.....	50C, 50CW, 50DW, 65B, 65BW, 75C, 75DW.
28-10	88	R.M. Metal.....	100C, 100CD, 100EW, 150A, 150BG, 150BW.
28-13	87	R.M. Metal.....	200AW, 500AW.
28-16	92	R.M. Metal.....	30F.
28-18	89	R.M. Metal.....	50E.
R-702-B	86	Lead.....	1, 2, 4, 5, 8, 15, 15A, 18, 18A, 21, 21A, 22, 24B, 50B, 65A.
R-2702	85	Asbestos.....	75A, 75AW, 100A, 100AW.
R-3323	82	Lead.....	20A, 20AW, 30B, 30CW.
R-3353	2	R.M. Metal.....	12A, 12B, 13A, 14A.
R-5517	84	Lead.....	50A, 50B, 50BW, 65A, 65AW.

CRANKCASE BASE GASKETS

72-1	76	Lead.....	75B, 75CW, 100B, 100C, 100CD, 100CW, 125A, 125AW, 150A, 150BG, 150BW.
72-6	79	Lead.....	200A, 200AW.
R-3322	75	Lead.....	20A, 20AW, 30B, 30C, 30CW, 30DW.

COMPRESSOR BASE GASKETS

72-8	62	R.M. Metal.....	
72-11	54	R.M. Metal.....	19A, 19D.
R-3358	54	Lead.....	12A, 12B, 13D, 14A.
R-5534	76	Lead.....	50B, 50BW, 65A, 65AW.

CRANKCASE COVER GASKETS

77-5	1	Copper.....	Replaces Servel Part No. 77-2.

RECEIVER END PLATE GASKETS

785-1	5	Lead.	
785-2	6	Lead.....	75B, 75CW, 100B, 100CW, 125A, 125AW.
785-3	30	Lead.....	20A, 20AW, 30D, 30DG, 30E, 30EW, 40AW, 50D, 50DW, 75DG, 75DW, 200BD, 200CD, 750D.
785-4	29	Lead.....	100C, 100EW, 150A, 150BG, 150BW, 200A, 200BW.

GASKET INFORMATION—8

For Type Numbers Refer to Charts

For Copeland Units

Manufacturers No.	Type No.	Material	Type Gasket	For Expansion Valve Model	For Expansion Valve Part No.
COMPANION FLANGE GASKETS					
944-2	1	Lead	(For S.O. Valve) 50C, 50CW, 65B, 65BW, 75B, 75CW, 100B, 100CW, 125A, 125AW.		
944-3	24	Copper-Asbestos	50D, 50DW, 75C, 75CW, 75DG, 75EW, 100C, 100CD, 100CW, 150A, 150AW, 200A, 200AD, 200BD, 200BW.		
964-1	1	Lead	(For Discharge S.O. Valve) 50C, 50CW, 65B, 65BW.		
R-708	37	Lead	1, 2, 5, 8.		
R-2720	1	Lead	75A, 75AW, 100A, 100AW.		
R-3139	1	Lead.			
R-6131	24	Copper-Asbestos.			
R-6708	24	Copper-Asbestos	13A, 14A, 20A, 20AW, 20B, 23A, 24A, 24B, 24C, 30A, 30AW, 30B.		
SUCTION SHUTOFF VALVE BODY GASKETS					
944-1	44	Lead	50D, 50DW, 75C, 75CD, 75CW, 75DG, 100CD, 100CW, 150A, 150AW, 150BG, 200A, 200AD.		
R-3324	44	Lead	20A, 20AW, 30B, 30CW.		
DISCHARGE VALVE PLATE GASKETS					
R-701-B	112	Lead	1, 2, 4, 5, 8, 15, 15A, 18, 18A, 21, 21A, 22, 24B, 24C, 50B, 65A.		
R-2701	111	Asbestos	75A, 75AW, 100A, 100AW.		
COMPRESSOR BEARING PLATE GASKETS					
R-703	6	Asbestos	1, 2, 4, 5, 8, 15, 15A, 18, 18A, 21, 21A, 22, 24B, 50B, 65A.		
R-3307	5	Lead	20A, 20AW, 30B, 30C, 30CW, 30DW.		
R-5526	6	Lead	50A, 50B, 50BW, 50C, 50CW, 65A, 65AW, 65B, 65BW.		
SEAL RING GASKETS					
R-706	1	Lead	15, 18, 21, 22.		
R-3359-C	15	Lead	1, 2, 4, 5, 8, 15, 18, 20A, 20AW, 21, 22, 24B, 24C, 30B, 30CW, 50B, 50BW, 50C, 50CW, 65A, 65AW, 65B, 65BW.		
MISCELLANEOUS GASKETS					
60-1	6	Lead	Crankcase Front Bearing Gasket for Model 100C, 100CD, 100EW, 150A, 150BG, 150DW, 200A, 200AD, 200AW, 200BD, 200BW.		
63-1	4	Lead	Crankcase Front Bearing Seal Ring Gasket for Model 75B, 75CW, 75EG, 100B, 100C, 100CD, 100CW, 100EW, 125A, 125AW, 150A, 150BG, 150DW, 200A, 200AD, 200AW, 200BD, 200BW.		
375-1	13	Lead	Valve Plate Gasket for Model HS-10C, HS-10D, HS-10E.		
R-700	76	Lead	Cylinder Housing Gasket for Model 1, 2, 4, 5, 8, 15, 15A, 18A, 21, 21A, 22, 24B, 24C, 50B, 65A.		
R-705-B	3	R.M. Metal	Needle Valve Cage Gasket for Servel No. R-1000-B and R-1036-B Float Assemblies.		
R-707-B	115	Lead	Float Chamber Cover Gasket for Servel No. R-1005-X and R-1036-X Float Assemblies.		
R-709-B	1	Lead	Seal Spool Gasket for Model 21, 22.		
R-710	1	Lead	Throttle Housing Gasket for Model 1, 2, 5, 8, 15, 18, 21 (Flat Flange).		
R-2700	77	Asbestos	Cylinder Housing Gasket for Model 75A, 75AW, 100A, 100AW.		
R-2832		Lead	Float Valve By Gasket for Model L1, L2, L3, L4, L10, LT5.		

GASKET INFORMATION—9

For Type Numbers Refer to Charts

For Copeland Units—Miscellaneous—Cont.

Manufacturers No.	Type No.	Material	Compressor Model
R-2853	5	Lead	Float Head Gasket for Model L1, L2, L3, L4, L10, LT5.
R-2882	1	Lead	Connection Gasket.
R-3393		Lead	Suction Strainer Gasket for Model 30A, 30AW.
R-6209	24	Copper-Asbestos	Valve Plug Gasket for Model 1, 2, 4, 5, 8, 15, 18, 20A, 20AW, 21, 22, 24B, 24C, 30B, 30CW 50C, 50CW, 65B, 65BW.
R-6260	1	Copper	Bellows Seal Gasket for Model 1, 2, 4, 5, 8, 15, 18, 20A, 20AW, 21, 22, 24B, 24C, 30B, 30CW, 50C, 50CW, 65B, 65BW.
R-6710	1	Lead	Syiphon Throttle Housing Gasket for Model 15, 18, 21, 21A (Grooved Flange).
RB-8153	1	Rubber	Inlet Fitting Gasket.
RB-8191	1	Cork	Bubbler Connection Gasket.
RB-8191-B	1	Cork	Bubbler Connection Gasket.
RB-8786	9	Chipboard	Water Supply Tank Head Gasket.
RB-8853	41	C. I. Rubber	Water Supply Tank Inlet Gasket.

WASHERS

239-67	1	Celluloid	For Model CB-C1, CB-C2, CB-C3, CB-C4, SB-C1, SB-C2, SB-C3, SB-C4, SD-45, SD-55, SD-65, SD-85.
239-115	1	Leather	Beer Connection Washer.
247-21	1	Copper	For Model WG-500.
247-36	1	R.M. Metal	Compressor Head Washer for Model 19A, 19D.
247-59	1	Copper	Seal Washer.
247-61	1	Fibre	For Model 50DW.
247-62	1	Fibre	
R-2572	1	Copper	For Model 75A, 75B, 75BW, 75CW, 75EG, 100A, 100B, 100BW, 100C, 100CW, 100DW, 125A, 125AW, 150A, 150AW, 200A, 200AW.
R-2573	1	Copper	For Model 50AW, 75AW, 100AW.
R-5556	24	Copper-Asbestos	For Model 14B, 14C, 50C, 50CW, 50D, 50DW, 65B, 65CW, 65EG, 75B, 75C, 75CW, 100B, 100CW, 125A, 125AW, 200A, 200AW.
RB-8164	1	Lead.	
RB-8226	1	Fibre.	
RB-9065	1	Lead.	
RB-9066	1	Lead.	
RB-9107	28	Lead.	
RB-9328	1	Lead.	

For Zerozone Units

CYLINDER HEAD GASKETS

1472	4	Asbestos	S2, SC.
1682	74	Asbestos	F, T3, TC.
2458	93	Asbestos	G, K, WG, WK.
2548	14	Asbestos	A2, L2.

CYLINDER HEAD CAP GASKETS

1471	4	Asbestos	S2, SC.
1683	83	Asbestos	F, T3, TC.
2459	113	Asbestos	G, K, WG, WK.

CRANKCASE GASKETS

1473	19	Asbestos	S2, SC.
1681	109	Asbestos	F, T3, TC.
2457	109	Asbestos	G, K, WG, WK.

GASKET INFORMATION—10

For Type Numbers Refer to Charts

For Zerozone Units

Manufacturers No.	Type No.	Material	Compressor Model
		SEAL FLANGE GASKETS	
2139	1	Asbestos.....	A2, B49, D, F, L2, S2, SC, T3, TC.
2259	1	Asbestos.....	I, R, WI, WR.
2455	1	Asbestos.....	G, K, WG, WK.
		END CAP GASKETS	
2260	2	Asbestos.....	I, R, WI, WR.
2456	2	Asbestos.....	G, K, WG, WK.
		END PLUG GASKETS	
1475	1	Asbestos.....	S2,SC, TC.
2547	1	Asbestos.....	A2, L2.
2570	1	Asbestos.....	F, T3.
		BEARING GASKETS	
2255	22	Asbestos.....	Front and Rear Bearing Gasket for Model I, R, WI, WR.
2454	22	Asbestos.....	Front and Rear Bearing Gasket for Model G, K, WG, WK.
2549	21	Asbestos.....	Rear Bearing Gasket for Model A2, L2.
		MISCELLANEOUS GASKETS	
1155	38	Asbestos.....	Shut-off Valve Gasket for Model A2, F, G, I, K, L2, R, S2, T3, WG, WI, WK, WR.
1156	11	Asbestos.....	Expansion Valve Gasket.
1915	1	Asbestos.....	Seal Gasket.
2257	93	Asbestos.....	Cylinder Case Gasket for Model I, R, WI, WR.
2258	113	Asbestos.....	Cylinder Case Cap Gasket for Model I, R, WI, WR.
2522	2	Asbestos.....	Receiver Tank Cover Gasket.
2550	60	Asbestos.....	Bottom Cover Gasket for Model A2, L2.
2599	1	Asbestos.....	Crankcase Plug Gasket.
3069	20	Asbestos.....	Head Cover Float Valve Gasket for Model F5V, F6V, F8V, F10V, F15V-Evaporators.
4061	4	Asbestos.....	Float Valve Header Gasket.

For Fedders Units

			Description
ER-4234-A	4	Special.....	Front Header Gasket (6-Hole Mounting).
ER-4305-A	1	Copper.....	For Hexagon Head Cap Screws.
ER-4360-A	1	Lead.....	Float Valve Header Gasket.
ER-4361-A	1	Lead.....	Liquid and Suction Valve Gasket.
ER-4465-A	1	Lead.....	Front Header Gasket (8-Hole Mounting).

Save these gasket information pages for convenient reference. Cut out along border line and punch holes as indicated and file in flexible binder. Binder can be secured for One Dollar from THE REFRIGERATION SERVICE ENGINEER.

tin, antimony and copper and is superior to plain lead in gasket problems. The surface is given a special matte finish which provides superior sealing powers than the bright surface of ordinary lead.

In each listing the proper material is indicated and best results will be had by adhering to the gasketing specified. Among the gasketings used are: diaphragm cloth, cork, asbestos, copper, asbestos-copper, rubber, lead, paper, steel, celluloid and leather; each having certain characteristics which suit it to a particular application.

Types

The type diagrams merely indicate shape and general design of the gasket, but do not indicate size or comparative size.

The first type shown (No. 1) is the simple ring shape. This ring will vary from a small valve gasket to the large kind used on float headers, but both are grouped under the shape characteristic. Again, the ring type may be pierced with bolt holes. Inner and outer circumferences vary with different designs, as do the number of holes; therefore only the general outline, with some latitude in variance, is shown.

Figure 37 is a typical flange gasket, of which there are a number of sizes.

To locate proper gasket number, first refer to the manufacturer and then to the compressor model. The type number will assist in identifying the gasket and assure ordering proper gasket.

Service Suggestions *(2nd Article)*

Majestic Electro-Sealed Units

In This Article Are Given Service Procedures and Service Methods on the Models 100 and 200 Series of the Majestic Electro-Sealed Units.

IN the January issue, we considered the construction and operation of the Majestic Electro-Sealed Unit. This article outlines general service suggestions covering the Models 100 and 200 series.

Hermetic and Electro Sealed Units

See Service Chart Diagnosis

SYMPTOM "A" UNIT WILL NOT START

Cause 1: No current at wall plug.

TEST: Test outlet with lamp or voltmeter.

REMEDY: Install new electric line to outlet or replace receptacle if found defective. The line or extension must be heavy enough to carry the load required.

Cause 2: Line cord or defrosting switch defective.

PROCEDURE: Remove cover of control box. On Model No. 100 Unit first unscrew the overload trip re-set knob.

TEST: Test with voltmeter or lamp across line cord terminals "B" and "C" on Bakelite Panel as shown in Fig. 15 for Model No. 100 Unit. On Models Nos. 101. 102. 103. 205. 207. 209 make the same test at line cord terminals "3" and "5" as shown in Fig. 15.

REMEDY: If outlet is found to have current and no current is available across line cord terminals, open circuit is present either in line cord. Defrosting Switch (Model 100), or Thermal Cut-out assembly (Models 100-101-102-103). Determine location of trouble and replace defective part.

Caution: In the event a thermal link has opened, both links must be replaced by new links. See "Thermal Cut-out" description on page 34 of January issue.

Cause 3: Thermostat switch in open position. Separable plug loose on Models 205, 207, 209 thermostats.

PROCEDURE: With the cover removed from the control box, the thermostat switch is in plain view.

TEST: On Models 205, 207, 209 operate re-set knob several times to determine that switch parts are not binding. Warm the thermostat bulb on the evaporator. After a short time this heat should close the thermostat switch.

REMEDY: If thermostat remains open when tested as above, it is apparent that the gas has leaked from the thermostat bulb. Remove entire thermostat assembly and replace. (See Service Methods) to be published in March issue.

TEST: On type S.M. Thermostat manually operate switch and examine for broken Pig-Tail Lead.

REMEDY: Make repairs or replace thermostat. (See Service Methods) to be published in March issue.

Cause 4: Overload trip stuck in "off" position. (Model No. 100.)

PROCEDURE: Remove the cover on the control box.

TEST: Check the operation of the overload trip mechanism as described on page 31, January issue.

A preliminary check on this mechanism, can be made without the use of the electrical test panel, as follows:

When in running position, the bi-metal strip will be cold and the anvil on the end will be in contact with one of the projections on the inner disc.

SERVICE CHART FOR DIAGNOSIS OF ALL HERMETIC AND ELECTRO-SEALED UNITS

Remedies for these service complaints are given under "Symptom" headings in this article

SYMPTOMS	CAUSE 1	CAUSE 2	CAUSE 3	CAUSE 4	CAUSE 5	CAUSE 6	CAUSE 7	CAUSE 8	CAUSE 9	CAUSE 10
SYMPTOM A Unit Will Not Start.	No Current at Wall Plug.	Line Cord or Defrost Switch Defective.	Thermostat Switch in Open Position.	Overload Trip Stuck in "Off" Position. (Mod. 100.)	Heating Element on Bi-Met. Strip Burned out.	Open circuit.	Therm. Switch or Relay Contacts corroded.	Pump not unloaded. Check Valve Leaking.	High Pressure Cut-Out Tripped (Models 205, 207, 209.)	Defective Compressor.
SYMPTOM B. Unit Starts But Will Not Continue Running.	Line Voltage either too high or too low.	Starting Relay Not Operating Properly.	Electrical Condenser Defective.	Transformer Defective (Models 100, 101, 103.)	Air not circulating thru radiator condenser.	Stuck Shut Float Valve.	Defective Compressor.			
SYMPTOM C High Current Consumption; Unit Runs too Long; Unit overheats.	Unit operating under conditions of extreme heat.	Insufficient air flow thru condenser.	Excessive Frost on Evaporator.	Thermostat set too cold.	Leaky check or float valve.	High Wattage.				
SYMPTOM D Unit Runs Continuously Without Adequate or No Refrig.	Float Valve Leaking.	Stuck Shut Float Valve.	Low SO_2 charge or oil logged evaporator.	Check Valve Stuck Shut.	Overcharge of Refrigerant.	Condensation.				
SYMPTOM E Short Cycles. Unit Stops and Starts at Frequent Intervals.	Leaky Check Valve.	Thermostat differential too close.								
SYMPTOM F Unit is Noisy.	Fan Motor Noisy.	Compressor not free on support springs or rubber-suspension.	Tubing vibrating.	Improperly located cabinet.	Compressor Noisy.					
SYMPTOM G Odors in or Around Refrigerator.	Refrigerant Leak.	Spoiled foods left in refrigerator.	Food not in closed containers.	Cabinet Temperature too warm.						
SYMPTOM H Ice Cubes Freeze But Food Compartment Not Cold Enough.	Excessive frost on evaporator.	Paper or cloth placed on shelves not permitting proper air circulation	Warm Foods placed in refrigerator.	Food crowded on Shelves restricting air circulation.						
SYMPTOM I Desserts do not freeze.	Recipes for Desserts not followed correctly.	Not sufficient freezing time allowed.	Excessive amount of low freezing point ingredients used.	Thermostat not adjusted properly.	Refrigerator in room that is too cold.					
SYMPTOM J Ice cubes do not Freeze.	Foreign matter in water.	Refrigerator in room that is too cold.	Not sufficient freezing time allowed.							
SYMPTOM K Food freezes in Refrigerator.	Thermostat at contact point "sticking closed" or sluggish.	Thermostat Bulb not fastened tight in clamp.	Thermostat not adjusted properly.							
SYMPTOM L Refrigerator sweating inside.	Gasket on door leaking warm air into the cabinet.	Air leak at unit opening.								

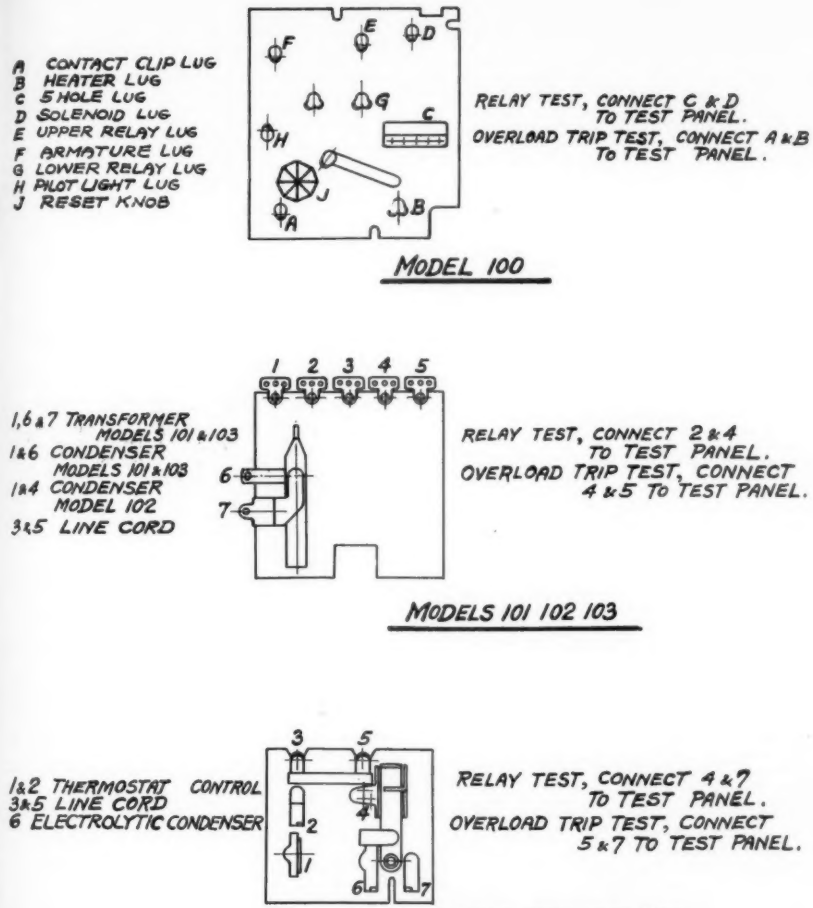

A CONTACT CLIP LUG
B HEATER LUG
C 5 HOLE LUG
D SOLENOID LUG
E UPPER RELAY LUG
F ARMATURE LUG
G LOWER RELAY LUG
H PILOT LIGHT LUG
J RESET KNOB
RELAY TEST, CONNECT C & D TO TEST PANEL.
OVERLOAD TRIP TEST, CONNECT A & B TO TEST PANEL.
MODEL 100
1,6 & 7 TRANSFORMER MODELS 101 & 103
1 & 6 CONDENSER MODELS 101 & 103
1 & 4 CONDENSER MODEL 102
3 & 5 LINE CORD
RELAY TEST, CONNECT 2 & 4 TO TEST PANEL.
OVERLOAD TRIP TEST, CONNECT 4 & 5 TO TEST PANEL.
MODELS 101 102 103
1 & 2 THERMOSTAT CONTROL
3 & 5 LINE CORD
6 ELECTROLYTIC CONDENSER
RELAY TEST, CONNECT 4 & 7 TO TEST PANEL.
OVERLOAD TRIP TEST, CONNECT 5 & 7 TO TEST PANEL.
MODELS 205 207 209

FIG. 15. ELECTRICAL CONNECTION FOR USE WITH PREMIER TEST PANEL.

In this normal position, the circuit through the "trip" is complete and the unit should run. Examine the contacts at the rear of the "trip." If, however, the bi-metal strip is cold, and the anvil is beneath a projection on the outer disc, the circuit is broken and the unit will not run.

REMEDY: Push the anvil towards the bakelite panel, thus freeing it from the projection on the outer disc. If the "trip" spring is wound and operative, the disc should immediately escape until a projection on the inner disc strikes the anvil. In this position, the contact should be "made" and the unit should run. If the anvil is found to be stuck, examine the surface for roughness, etc., and if necessary remove the bi-metal strip and anvil, which is held with three screws, and replace. The new assembly must be tested as described later on under "Service Methods." If any defect other than explained above is found, remove entire overload trip mechanism and replace. Test new assembly as per instructions under "Service Methods," to appear in the March issue.

Cause 5: Heating element on bi-metal strip burned out.

TEST: Check for continuity of electrical circuit through this element and inspect for break.

REMEDY: If found defective, replace bi-metal strip assembly or heater element. Test new assembly as per instructions under "Service Methods," to appear in the March issue.

Cause 6: Open Circuit.

TEST: Test motor for continuity.

REMEDY: If open circuit is found when checked at base of compressor, unit must be replaced. Be

sure that the open circuit is within the compressor dome.

TEST: Examine all soldered connections for open circuit.

REMEDY: Solder loose connections (avoid use of excessive solder or acid flux).

TEST: Check starting condenser and transformer for open circuits.

REMEDY: Replace defective assembly.

Cause 7: Thermostat switch or relay contacts corroded.

TEST: Contact trouble usually results in open circuit. Check for continuity of the circuit through the contacts.

REMEDY: If contacts are badly damaged replace entire defective assemblies.

Cause 8: Pump not unloaded. Check valve leaking.

TEST: If the evaporator is cold and unit attempts to start, a badly leaking check valve will stall the motor and cause the overload trip to kick out. If the unit will not start, it is a fairly definite indication that the check valve is leaking. The reason that the unit will not start is because of unequalized pressures. The gas leaking through the check valve is condensed in the cold evaporator which thus prevents the pressure from equalizing on both the high and low sides of the compressor. Allow the evaporator to warm to room temperature. When the evaporator is at the same temperature as the compressor, the pressure is equalized although check valve has been leaking. When the pressures are equalized, the unit will start.

REMEDY: If the above test is carefully made, and check valve is thought to be defective, test further as explained in Symptom E, Cause 2, before replacing unit.

Cause 9: High pressure cut-out tripped (Models 205, 207, 209).

TEST: Remove control cover and examine escapement.

REMEDY: Reset cutout switch by returning pivoted toggle arm to normal position and conduct following test:

CAUTION: Check position of washer and spring between insulator and escapement lever as shown in Figure 13, Page 39 of the January issue.

INSTALL PRESSURE GAUGE ON FLOAT CHAMBER AS EXPLAINED UNDER "GENERAL SERVICE PRACTICE." Operate unit to determine whether excessive pressure will develop. If this condition is found and cannot be corrected, unit must be replaced.

NOTE: Excessive pressures may be caused by defective fan, dirty condenser, restricted air circulation, recirculation of hot air, stuck-shut float or restricted liquid line.

Cause 10: Defective Compressor.

TEST: If all electrical contacts are closed and the motor attempts to start but the relay will not drop back to running position, a defective pump may account for this condition. In order to determine definitely that compressor is defective check as follows:

1. Line voltage and power supply.
2. Relay contacts and adjustments.
3. Electrical condenser and transformer.
4. Electrical circuit grounded.

REMEDY: If compressor is defective, the unit must be replaced.

SYMPTOM "B" UNIT STARTS BUT WILL NOT CONTINUE RUNNING

Cause 1: Line voltage either too high or too low.

TEST: With the voltmeter connected across the line, start the unit and note the voltage. Unit will operate between the limits of 90 to 140 volts. Higher or lower voltage may cause trip to "kick" out.

REMEDY: If improper voltage is found, circuits and service lines to premises must be checked.

Cause 2: Relay not operating properly.

TEST: Check operation of relay. See Page 30, January issue. With cover removed, note the operation when unit is started. When the unit starts, the weight below the coil should be lifted, so that contact is made by the points on the arm against the upper contact. In this position, the upper end of the plunger rod should be free of the arm. If the current continues to flow and the unit does not start, the overload trip will cut out. When the motor reaches running speed, the current drops to normal. With this decreased amperage flowing through the starting relay coil, the weight will drop. This is the correct running position. Check freeness of armature screw when starting.

REMEDY: If not free and readily adjustable, replace entire starting relay assembly and adjust as outlined under "Service Methods," to appear in the March issue.

Cause 3: Electrical Condenser defective.

TEST: Test condenser.

REMEDY: If found defective, replace with new condenser.

Cause 4: Transformer Defective (Models No. 100, 101, 103).

TEST: Check transformer.

REMEDY: If found defective, replace with new transformer.

Cause 5: Air not circulating through radiator condenser.

TEST: Check fan motor and see that it is operating properly. Check air intake, and see that it is not clogged. If cabinet is provided with screen on intake flue, remove same. Check for restriction of air through radiator condenser. See Fig. 4, January issue. Check location of cabinet to determine whether cool air is being circulated. Also check for recirculation of hot air.

Cause 6: Stuck Shut Float Valve.

TEST: A stuck shut float valve is evidenced by (a) warm liquid line; (b) high wattage; (c) overload trip kicking off due to high pressures. An oil logged float chamber will also create the above conditions.

REMEDY: Use electro magnet to open float valve. Hold float valve open until float chamber is empty. A hissing sound caused by the refrigerant passing through float valve opening, in gas form, indicates that float chamber is emptied of oil and liquid. Operate float valve several times with magnet to determine that valve assembly is free. (See Figure 4, January issue.)

Cause 7: Defective compressor.

TEST AND REMEDY: See Symptom "A" Cause 10.

SYMPTOM "C" HIGH CURRENT CONSUMPTION; UNIT RUNS TOO LONG; UNIT OVERHEATS

Cause 1: Unit operating under conditions of extreme heat.

TEST: Check the running time with a Telechron clock. If running time is too long as compared with normal operation, determine what demand has been placed upon the unit for refrigeration. How much warm food was stored, how often door was opened, how often water was placed in cube trays, are factors affecting refrigeration load. Check door gaskets. If nothing unusual is found in above condiitons, check further as follows: Place a recording thermometer in the refrigerator to obtain a record of cabinet temperatures.

REMEDY: Place refrigerator in a more desirable location if possible, and instruct user regarding placement of foods, etc.

Cause 2: Insufficient air flow through condenser.

TEST: Examine flues for restriction to normal air flow. Examine radiator condenser for lint or other obstruction. Check fan speed and fan motor oil supply.

REMEDY: Clean radiator condenser or move cabinet to a more desirable position if possible. Instruct user that a clean condenser reflects operating economy.

(Models 100, 101, 102, 103.) Clean condenser with small stiff brush. To oil fan motor, remove

condenser housing cover and oil with medium grade of good automobile lubricant. (Models 205, 207, 209.) To clean condenser remove two wing screws and lift cover. Clean with stiff brush. Replace cover and tighten wing screws. To oil motor, fill oil sump slowly through oil tube until oil level reaches sight hole at left side of sump.

Cause 3: Excessive Frost on Evaporator.

REMEDY: Defrost evaporator and instruct user as to proper care.

Cause 4: Thermostat set too cold.

TEST: Check cabinet temperature.

REMEDY: See Thermostat adjustment under "Service Methods."

Cause 5: Leaky check or float valve.

TEST: A leaky check valve or float valve may be evidenced by excessive current consumption due to increased running time.

REMEDY: See Symptom D, Cause 1 and Symptom E, Cause 2.

Cause 6: High Wattage.

TEST: Check wattage for period of at least 15 minutes.

REMEDY: If wattage is excessive, replace unit provided all other tests under Symptom C have been made.

SYMPTOM "D" UNIT RUNS CONTINUOUSLY WITHOUT ADEQUATE OR NO REFRIGERATION

Cause 1: Float valve leaking.

TEST: An excessively leaking float valve will frequently evidence itself by the sweating or frosting of the suction line.

REMEDY: To correct leaky float lift float ball with electro-magnet to allow liquid refrigerant to flush out the seat. Operate float a number of times to insure proper seating of needle. See Fig. 4, January issue.

Cause 2: Stuck Shut Float Valve.

See Symptom "B" Cause 6.

Cause 3: Low SO_2 charge or oil logged evaporator.

TEST: Examine evaporator. If portion of the tubes are not frosted or frost line is low, these conditions indicate a short SO_2 charge or an oil logged evaporator.

REMEDY: Defrost the evaporator and warm at least to room temperature.

Fill all ice trays with boiling water and start unit. Operate the unit. The entire evaporator should frost. If condition is improved but evaporator is still not totally frosted, repeat process. If the condition cannot be corrected with this remedy, the unit is undercharged.

Cause 4: Check Valve Stuck Shut.

TEST: Examine evaporator. If warm, check motor wattage. The above condition will cause the pump to operate at a deep vacuum with motor wattage considerably below normal.

REMEDY: Tap top of check valve sharply while unit is running to loosen plunger, being careful not to cause leaks at soldered joints. When plunger is released the unit will start refrigerating. If plunger cannot be released, unit must be replaced.

Cause 5: Overcharge of Refrigerant.

TEST: An overcharge of refrigerant will cause the suction line in the unit compartment to sweat and sometimes frost, causing loss of pump capacity. (Do not confuse with leaking float condition.)

REMEDY: If this condition is a permanent one, that is if suction line is always frosted, exchange unit.

Cause 6: Condensation.

This condition may be present in a unit that has been idle and out of use for a long time. It may also occur in a unit which has been subjected to severe temperature changes or improper handling. Condensation is not caused by a mechanically defective unit. Condensation raises the oil level in the compressor base so that the required amount of oil for efficient operation is not provided.

TEST: Examine unit for following symptoms:

1. Unit runs continuously.
2. No refrigeration.
3. Sweating evaporator.
4. Noisy compressor (vane rattle).
5. Fluttering check valve.
6. Cold oil line to and from oil cooler.
7. Condenser cooler than normal.

Practically all of the above symptoms must be present before the diagnosis can be determined as condensation.

REMEDY: Block Fan. Operate the unit with fan blocked until compressor base becomes warm enough to boil off the SO_2 liquid condensed in the base. Remove fan blocking and again start unit. It may be necessary to repeat this operation several times to introduce enough heat to boil off sufficient SO_2 to give normal operation. There is one condition that can exist, although it is rarely found, that will prevent a unit from responding to this treatment. The condition referred to is brought about by a quantity of oil getting into the float valve chamber. Oil does not flow as freely as liquid SO_2 and in the units using the ¼" liquid line between the float chamber and the evaporator, the flow of oil through this small line is quite slow. It is necessary to entirely clear the float chamber and the liquid line of oil before it is possible to get the liquid SO_2 back to the evaporator. The method prescribed in treating this condition is precisely as outlined above with the addition of using a magnet on the float, lifting the float ball and opening the needle valve which allows the head pressure to force the oil through into the evaporator, where it will finally be returned to the compressor.

SYMPTOM "E" SHORT CYCLES, UNIT STOPS AND STARTS AT FREQUENT INTERVALS

Cause 1: Leaky Check Valve.

TEST: Check temperature of suction line in food compartment below check valve after unit has been idle for several minutes. Leakage of hot oil will raise suction line temperature at this point above normal.

REMEDY: Flush check valve with liquid SO_2 momentarily by tipping unit forward several times (with compressor running) sufficiently far to cause suction line between compressor and check valve to become cold. This will tend to clean plunger and seat of oil or foreign matter. Tap check valve sharply several times, being careful not to cause leaks at soldered joints.

Cause 2: Thermostat differential too close.

TEST: If temperature of cabinet at start and stop of cycle shows less than normal variation, the thermostat differential is too close.

REMEDY: Remove thermostat assembly and check with ice and salt bath as explained under "Service Methods," to appear in the March issue.

SYMPTOM "F" UNIT IS NOISY

Cause 1: Fan motor noisy.

TEST: Start unit holding fan stationary. Check oil.

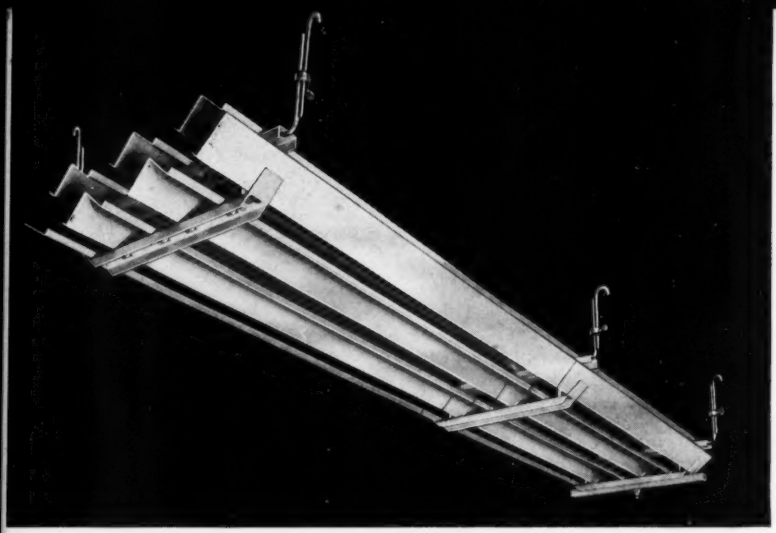
REMEDY: If fan shaft has too much end play add washers. If this will not remedy the cause of noise replace with a new fan. Check Fan Blades for alignment. Oil fan motor as explained under Symptom "C" Cause 2.

Cause 2: Compressor not free on support springs or rubber suspension.

REMEDY: Loosen compressor hold down nuts, shipping cups or strap. Do not remove cotter pins on Models Nos. *205, 207* and *209*. Be sure compressor does not rest on mounting base.

Cause 3: Tubing vibrating.

REMEDY: Carefully bend tubing so that it does not come in contact with any other parts. Frequently a small piece of soft rubber or felt will deaden vibration.



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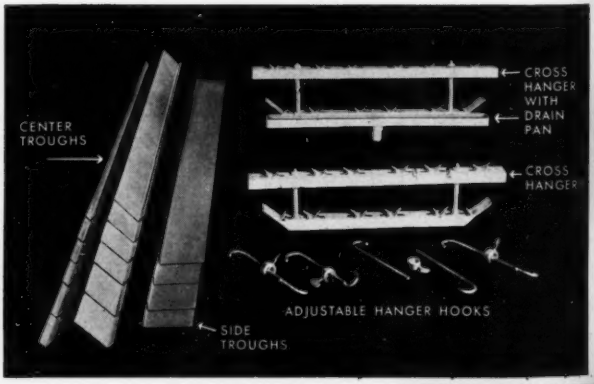

Above photograph shows component parts.

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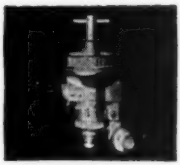
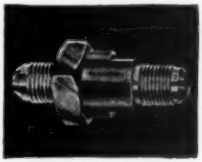


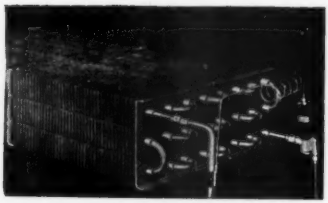
Constant Pressure Valves

Thermostatic Expansion Valves

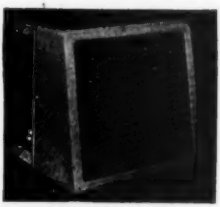


Check Valves

Thermostatic Expansion Valves



Finned and Finless Coils



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Cause 4: Improperly located cabinet.
TEST: Check position of cabinet and means of support. Frequently the floor construction will be at fault and should be braced or cabinet moved to a more desirable location. Determine that cabinet is setting solidly on floor.
Cause 5: Compressor Noisy.
TEST: If noise cannot be located as per above tests, it no doubt is within the compressor. *(Always examine for symptoms of condensation in dome.)* See Symptom D, Cause 6.
REMEDY: Except for condensation in the dome, replace unit.

SYMPTOM "G" ODORS IN OR AROUND REFRIGERATOR

Cause 1: Refrigerant leak.
TEST: Test with 28% ammonia solution. If a small rag saturated with this solution is brought near a sulphur dioxide leak, a white smoke will be formed. Secure this ammonia from a drug-store.
REMEDY: Remove the unit at once, and replace.
Cause 2: Spoiled foods left in refrigerator.
Cause 3: Food not in closed containers.
Cause 4: Cabinet temperature too warm.
TEST: Check amount of frost on coils. Check box temperature, using recording thermometer if possible.
REMEDY: Defrost unit. Empty all ice trays and scald with hot water. Clean ice tray shelves, food shelves, food compartment and defrosting tray with mild solution of baking soda and lukewarm water. Check cabinet temperature after unit has started again. Adjust thermostat if necessary.

SYMPTOM "H" ICE CUBES FREEZE BUT FOOD COMPARTMENT NOT COLD ENOUGH

Cause 1: Excessive frost on evaporator.
REMEDY: Defrost completely.
Cause 2: Paper or cloth placed on shelves not permitting proper air circulation.
REMEDY: Remove paper, etc., from shelves.
Cause 3: Warm foods placed in refrigerator.
Cause 4: Food crowded on shelves restricting air circulation.
REMEDY: Instruct user as to proper placing of foods.

SYMPTOM "I" DESSERTS DO NOT FREEZE

Cause 1: Recipes for desserts not followed correctly. Too much flavoring extract used which lowers freezing point due to presence of alcohol.
Cause 2: Not sufficient freezing time allowed.
Cause 3: Excessive amount of low freezing point ingredients used.
Cause 4: Thermostat not adjusted properly.
TEST: Check setting of thermostat. Instruct user regarding proper use of cold control, especially for freezing desserts.
Cause 5: Refrigerator in room that is too cold. The unit does not run long enough to freeze desserts.

SYMPTOM "J" ICE CUBES DO NOT FREEZE

Cause 1: Foreign matter in water.
Cause 2: Refrigerator in room that is too cold.
Cause 3: Not sufficient freezing time allowed.

SYMPTOM "K" FOOD FREEZES IN REFRIGERATOR

Cause 1: Thermostat at contact point "sticking closed" or sluggish.
TEST: Check cabinet temperature with thermometer. Determine whether contact points are sticking.
Cause 2: Thermostat bulb not fastened tight in clamp.
TEST: Check bulb and tighten.
Cause 3: Thermostat not adjusted properly.
REMEDY: Make adjustments as per instructions.

SYMPTOM "L" REFRIGERATOR SWEATING INSIDE

Cause 1: Gasket on door leaking warm air into the cabinet.
TEST: Check door gasket.
REMEDY: If gasket does not seal, replace or vary the shims beneath the latch, hinges, etc., until door seals properly.
Cause 2: Air leak at unit opening.
TEST: Check gaskets for seating.
REMEDY: If found defective, replace to give proper seal.

In the March issue will appear the concluding article on Service Methods for the Majestic hermetic job.

Third Article

Electronics for Servicemen

Electricity Is an Important Part of a Service Engineer's Knowledge. This Article Continues the Study of Electronics from the January Issue.

By WALTER G. CHRISTIE, B.S.E.E.

The Watt-Hour Meter

THE watt-hour meter is used to check power consumption on jobs. It is of the same type as that used by power companies in the basement of each consumer's home. It records the power drawn in kilowatt hours. See Fig. 1.

The watt-hour meter is connected in the same way as is the watt-meter. There are generally four binding posts, two heavy and two light. The heavy posts are connected in series with one side of the line. The light posts are connected, one to each incoming line. See Fig. 2. For use on household appliances, the hook up of Fig. 2B is very handy and will prevent wrong connections.

To use the watt-hour meter, connect it up as shown in Fig. 2A and 2B. Then record the reading of the scale. Suppose the scale reads as in Fig. 1A. This is read as 1926, not 2926. (If it were 2926, the pointer would be near 3000.) In figure 1B, the reading is 2026.

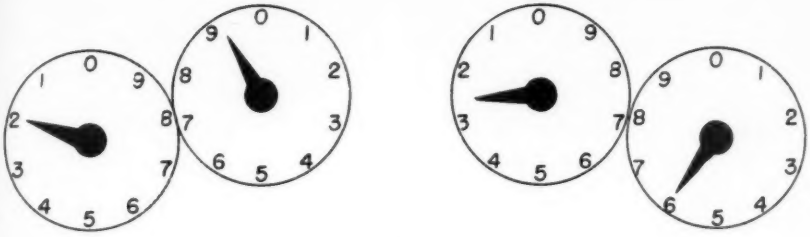


Fig. 1A - Watt-hour meter reading 1926 Watt-hours.

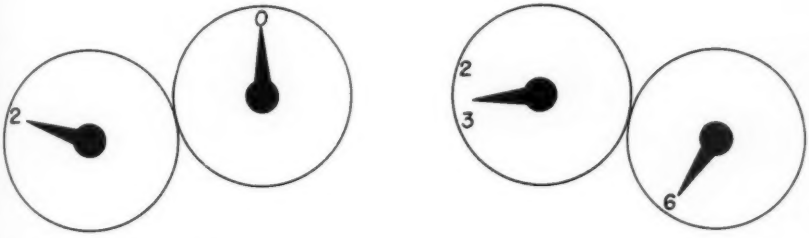


Fig. 1B - reading 2026 Watt-hours.

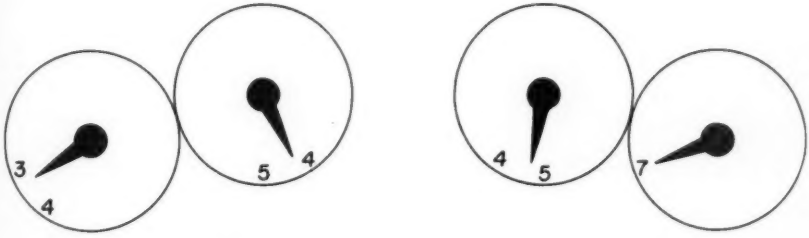


Fig. 1C - reading 3447 Watt-hours.

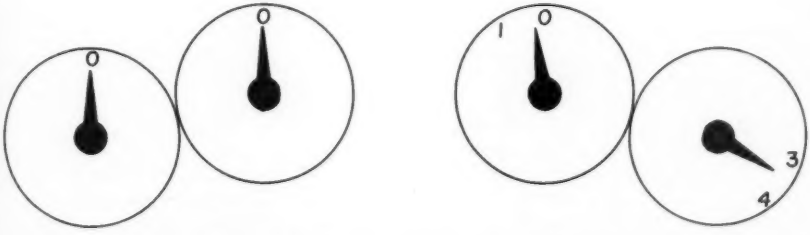


Fig. 1D - Kilowatt-hour meter reading 3447 Watt-hours, or 3.4 kilowatt-hours.

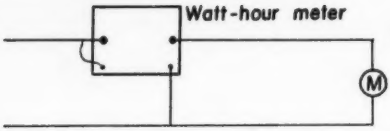


FIG. 2A. SCHEMATIC HOOK-UP FOR WATT-HOUR METER.

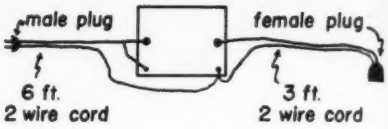


FIG. 2B. PERMANENT SET-UP FOR WATT-HOUR METER.

Leave the meter connected for at least 24 hours. Then take another reading. Suppose, the machine used 1521 watt-hours in 20 hours. The meter would then read 3447 as shown in figure 1C.

Kilo means thousand. Hence 3447 watt hours can be read as 3.447 kilowatt-hours. The meters used by the light companies to record consumer's consumption read in kilowatt-hours. Hence, if 3.447 kilowatt-hours were read on a light company meter it would appear as in figure 1D.

Let's figure the cost of operation for the above job per month.

Meter reading in 20 hours...3447 watt hours
Meter reading at start.....1926 watt hours
Power used in 20 hours.....1521 watt hours
Power used in 24 hours:

$$\frac{24}{20} \times 1521 =$$

$$\frac{6}{5} \times 1521 = \frac{9126}{5} = 1825 \text{ watt hours}$$

Power used in 30 days:

$1825 \times 30 = 54{,}750$ watt-hours, or
54.75 kilowatt-hours

Cost of operation per month @ 5c per kw.-hr.

$54.75 \times .05 = \$2.7375$ or $2.74

Magnetism

Everyone has at some time played with a horseshoe magnet. Everyone knows that the magnet will attract iron and steel to it and that if the magnet is sufficiently strong, a piece of steel can be made to move about on the top of a wooden desk by moving the magnet which is held under the desk top.

A piece of ordinary steel can be made into a permanent magnet by inserting it into a coil of wire which is connected to a direct current voltage. For instance, a straight piece of steel such as a screw driver can be magnetized by winding a hundred turns of No. 14 wire around it and then connecting the coil of wire to a six-volt battery for several seconds. After the battery is disconnected and the wire unwound, the screwdriver will be capable of attracting small pieces of iron and steel. It will retain this magnetic property for several months unless the screwdriver is heated or unless it is dropped several times on a cement floor.

A piece of soft iron when wrapped with wire and connected to a battery will become a powerful magnet *while the power is flowing through the wire.* However, as soon as the current is disconnected, most of the magnetism will leave the iron and it will not attract nails and iron filings. Thus soft iron will not become a *permanent magnet.* While it is inside the current carrying winding, it is called an *electro-magnet.*

Polarity

Every magnet has two poles. One is called the north pole, the other is the south pole. The poles are located at the ends of the magnet. Hence, if the blade end of the magnetized screwdriver is a north pole, the butt end will be a south pole. To determine which end is a north pole, hang the screwdriver by a piece of thread from the ceiling so that the screwdriver is free to turn. The screwdriver will always swing to one position and stop. The position will always be such that the ends of the screwdriver run in a north-south direction. *The end of the screwdriver which points to the north is called a north pole. The other end will point south and is called a south pole.*

The Law of Magnetism

Now, if an ordinary pocket compass is held near the north end of the screwdriver, the compass needle *will turn so that the south pole of the compass will be pointing to the north pole of the screw driver.* If the

screw driver is moved around the compass, *the needle of the compass will turn with the screw driver so that the south pole of the compass will always follow the south pole of the screw driver.* Now if the screw driver is reversed so that its south pole is held near the compass *the north pole of the compass will turn to face the south pole of the screw driver.*

From these facts the law of magnetism can be stated. That is:

Like Poles Repel Each Other—Unlike Poles Attract. The operating principle of every electric motor depends upon this law of magnetism!

Motors:

D.C. Motors: In studying the operation of motors, let us first consider the simplest motor, the two-pole d.c. motor.

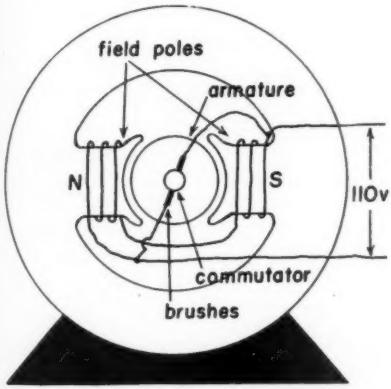


FIG. 3. TWO POLE D.C. MOTOR

The motor frame is built as shown in Fig. 3. When current passes through the field wires, the two field poles become magnetized, one becomes a north pole and the other a south pole. The poles are made of soft iron so that when the current stops flowing, the fields lose their magnetism. Soft iron is used because it produces a more powerful magnet than does steel for the same amount of current and the same amount of winding.

The armature of the motor is also made of soft iron. The armature is wound with many turns of wire. These turns are so distributed over the surface of the armature that the entire armature is wound with wire. The wires are so tapped and connected to the commutator that the path of the current through the armature is always the same. Thus, even though the armature revolves, the armature magnetism (due to the current flowing through the armature) is always in the same direction. Thus, in Fig. 4, the armature south pole will always be located a short distance away from the field's north pole. As a result, the armature will be pulled downward by the field's south pole as in Fig. 4. As the south pole of the armature approaches north pole of the fields, the commutator changes the flow of current in the armature so that that part of the armature which occupies the original position of the south pole is made into a south pole and the original south pole is made very weak. Hence, the motor continues to run as long

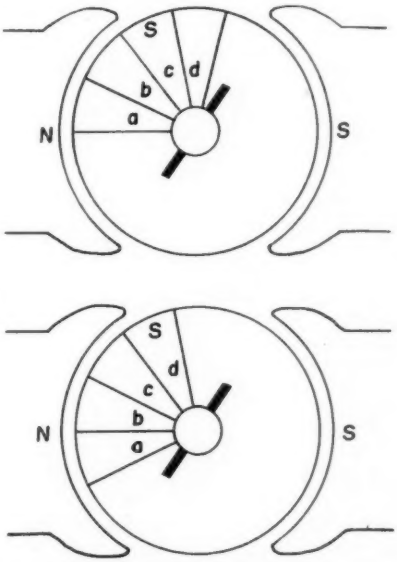


FIG. 4

Top—When current flows in the armature, the brushes so direct the armature current that Section C becomes a strong south pole, and Section C is pulled toward the north pole.

Bottom—When Section C is pulled to the North Pole, the brushes shift the path of current in the armature so that Section D (which now occupies the former position of Section C of top illustration) becomes a strong South Pole. As the armature turns, the brushes keep the armature and field magnetism in the same relative position. This keeps the armature revolving.

as current is supplied to its terminals (See Fig. 4).

Speed Control

D.C. motors often have three wires coming out to their terminal box. These wires are marked L, A, F. These markings stand for line, armature and field.

Small motors (up to one-half hp.) that

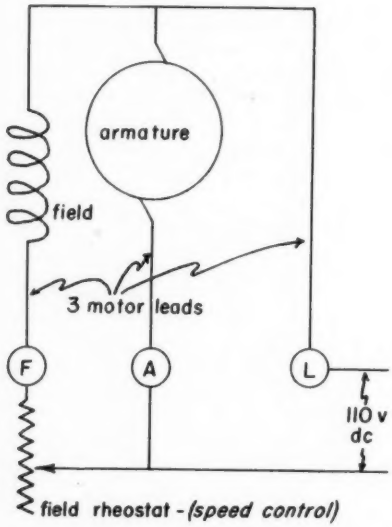


FIG. 5. SPEED CONTROL FOR D.C. MOTOR

are so marked are intended for use with a field rheostat to vary the motor speed. The speed of a d.c. motor depends upon the amount of current flowing in the field winding, the *more* current, the *slower* the speed. As we learned in the first article of this series in December, the current flowing in a circuit depends upon the resistance of the circuit, the higher the resistance, the smaller the current.

Hence, to control the speed of a d.c. motor, it is only necessary to install a rheostat (variable resistance) in series with the field. As the rheostat knob is turned, the motor speed will vary. This type of control is very popular on air-conditioner fan motors to vary the amount of air circulated in a room.

The motor is connected as in Fig. 5.

Reduced Voltage Starting

D.C. condensing units motors of over one-half h.p. also have the same terminal arrangement, that is lead wires marked L, A, and F. The reason for this arrangement is different from that of small fan motors.

When a condensing unit motor starts up, it is always overloaded for several seconds until the pressure in the crankcase is reduced. As a result, the motor draws a very large current. On a d.c. motor, the instantaneous current may be twenty times as great as the operating current. Because this current is passed to the armature through two small brushes, there is real danger that the commutator will be badly burned each time the motor starts. Hence, it is customary to install a starting box, on a d.c. motor, which reduces the starting voltage and hence the starting current. (See relation between current and voltage in Article One, December issue.) As the motor gains speed (the starting box gradually increases the voltage until at top speed) the full voltage is applied to the motor. The mechanism and adjustment to various starting boxes will be described in a later article. However, in order to avoid confusion between a d.c. speed control circuit and a d.c. reduced voltage starting circuit, Fig. 6 is given at this time.

The starting box consists of an electromagnet *C*, a resistor *R*, and a governor *D*. The electro-magnet is connected in series with the thermostatic or low pressure switch of the compressor, as shown in Fig. 6. When the switch is closed, current flows from line *A* through junction point *P*, through electromagnet coil *C*, back to line *B*. The iron bar inside the magnet starts to rise but it is slowed up by the piston and cylinder *D*. In a fraction of a second, it rises high enough to contact slide bar *E*, thus connecting the field to the motor as shown by the double arrows in Fig. 6. The motor field is now energized. *Note that the field is connected across the full voltage of the line at all times after the switch is closed.*

In another fraction of a second, the other finger of the starter contacts the resistor strip, thus connecting the armature to the line, through the resistor *R*. (See Fig. 6.)

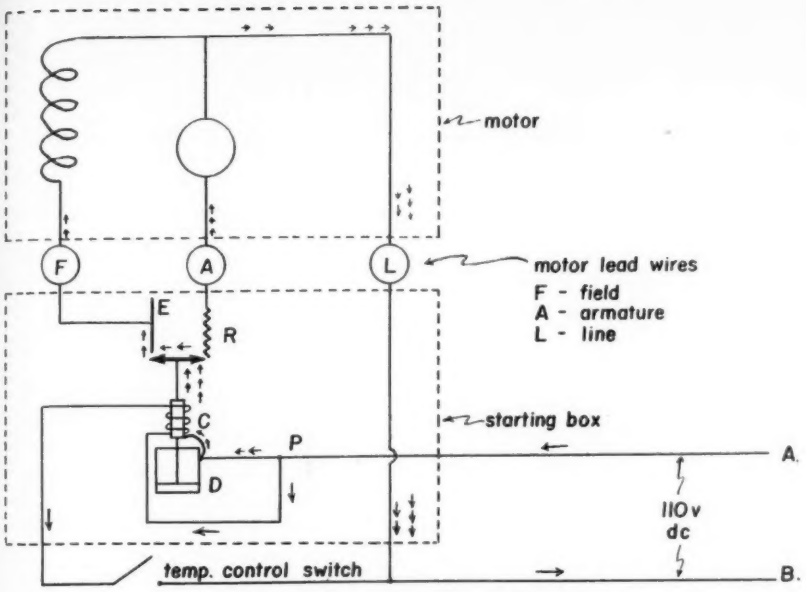


FIG. 6. REDUCED VOLTAGE STARTER.

When the control switch is closed, current flows through the electro-magnet (C) which raises the contacts and connects the field. Current through field is shown by → →. A fraction of a second later, the armature gets current through resistor (R) as shown by → → →.

Now the electro-magnet gradually overcomes the resistance of the piston and cylinder and resistor *R* is gradually cut out of the circuit. In about 10 seconds, the resistance is entirely cut out of the system and the full voltage is applied to the armature.

At this point Figs. 5 and 6 should be compared. From this comparison, it will be seen that for *speed control, the resistor is placed in the field circuit,* but for *reduced voltage starting, the resistor is placed in the armature circuit.*

The piston and cylinder of the starting box are so designed that the piston drops immediately when current stops flowing in the electro-magnet.

More will be said of starting boxes in a later article.

SNELL WITH C. NELSON MFG. CO.

MR. LOUIS M. SNELL, formerly with the Brunner Manufacturing Co. as sales representative, is now identified in the same capacity with the C. Nelson Manufacturing Co., of St. Louis, manufacturers of ice cream cabinets.

Mr. Snell will cover Illinois, Iowa and Michigan in the interests of this company.

Service Schools to Be Held

In conjunction with the Universal Cooler Corp., the C. Nelson Manufacturing Co. is conducting service schools on ice cream cabinet work. Mr. W. R. McFadden, of Universal, in cooperation with Nelson representatives will conduct these schools. The following itinerary has been arranged for subsequent schools, which have already been started:

February 22-23 Birmingham, Ala.
March 1- 2 Greensboro, N. C.
5- 6 Washington, D. C.
10-11 Harrisburg, Pa.
15-16 Pittsburgh, Pa.

The Question Box

Readers are invited to send their problems pertaining to the servicing of household refrigerators and small commercial refrigerating equipment as well as oil burners to "The Question Box." The following questions are answered by Mr. George H. Clark.

SUPERFEX ABSORPTION SYSTEM

QUESTION 180. *Does the Superfex kerosene absorption refrigerator use a float valve to regulate refrigerant entering evaporator? Does the suction line have a check valve in it to prevent the hot gas from re-entering the evaporator on the off-cycle or rather when the absorber is being heated and the refrigerant gas driven over into the condenser?*

ANSWER: I do not have any detailed information on the Superfex kerosene absorption system but I am quite sure it operates as some of the other absorption systems do in that no float valve is used to regulate the refrigerant entering the evaporator and I do not believe there is any check valve in the suction line to prevent hot gas from entering the evaporator on the off cycle. While the system is generating, the hot vapor passes through a tube into the condenser and then into the evaporator at the same pressure that obtains in the generator. The thing which keeps the liquid in the generator from being driven into the evaporator is a liquid trap which requires a higher pressure to force the liquid over than is required to force the gas over. Conversely when the system is absorbing, the gas is taken off from the top of the evaporator and passed into the absorbent while the liquid in the evaporator will not return through the same tube it entered. This is due to the fact that a liquid head would have to be overcome in a liquid trap in the evaporator so that only the vapor returns to the absorbent.

HEAT EXCHANGER-ACCUMULATOR

QUESTION 181. *On page 29 of the July, 1936 issue of* THE REFRIGERATION SERVICE ENGINEER, *you have a diagram of a condensing unit used for congealing brine. Would you please advise me why heat-exchanger and accumulator (H) would be omitted if ammonia were used as a refrigerant.*

Why cannot air-cooled condensers be used with ammonia machines?

ANSWER: This is answered by Mr. O. D. Greenlee of the Kold-Hold Manufacturing Company as follows:

"The heat exchanger-accumulator would be omitted from an ammonia system because it is not adaptable to that kind of refrigerant. This device is fabricated from a seamless steel shell with forged headers at each end. The liquid passing through this accessory is carried by a copper tube wound in spiral fashion and soldered to the inlet and outlet connections. Therefore, the device may be regarded as suitable for any refrigerant which will not create an undesirable reaction with the copper. Due to the different type of set-up that is used with an ammonia installation, the heat exchanger-accumulator such as we use in connection with small commercial installations, would not adapt itself readily to the set-up. In addition the increased capacities afforded by a heat exchanging device on small systems, are not as important in an ammonia installation where plenty of excess capacity is usually available and where one or more trucks may be connected to liquid and suction manifolds or headers.

"Air cooled condensers could be used with ammonia machines but we do not know of any manufacturer at the present time who is furnishing equipment of this nature. Due to relatively high condensing pressures, it is believed that air cooled condensers are not generally regarded as satisfactory for commercial operation. Water cooled condensers afford better efficiency, lower op-

erating costs, and eliminate certain disadvantages attendant to air cooling."

FRIGIDAIRE MULTIPLE JOB

QUESTION 182. *I am about to start work on a Frigidaire apartment house installation which is in bad shape, the compressor being stuck because of moisture contacting the SO_2. It is a model C compressor and the coils are 112TF in seventeen cabinets, on the second, third and fourth floors with the compressor in basement. The tubing runs are very long, being about 2,000 ft. ½ inch and 2,000 ft. ¼ inch, shut off valves at start of all seven parts of risers and individual valves for each cabinet. The moisture apparently entered the system at a slight leak at a flare joint in the suction about three weeks before it stuck. Our usual procedure in similar cases was to remove the entire system, discharge, and bake, then reinstall new lines. However, in this case it is almost impossible to remove or replace the tubing as most of it is in a small size Greenfield and one inch conduit.*

What do you think of the following idea to process the tubing without removal: remove all evaporators, condenser-receivers and completely discharge and dehydrate. Then install loops in each cabinet connecting liquid and suction lines and use CO_2 to force Methanol and carbon tetrachloride through the lines in each circuit and finally run several pounds of F-12 through each riser circuit as this is a powerful solvent and might remove scale should any more be present? I would also install an ample sized refrigerant drier in the liquid lines for some time. Do you think it would be well to use some zinc moss in the drier along with the drier chemical?

ANSWER: I think your ideas, with respect to blowing out the lines and then cleaning out the evaporators and compressor and condenser, should do a very good job.

My suggestion would be to completely remove all the present sulphur dioxide, clean out the receiver as well as possible with xylene and clean out the compressor, checking valves, and charge with new oil. I would also check all of the needles and seats in the evaporators, replacing where necessary and of course bake out all evaporators as well as the compressor and condenser. I believe that you can do a very good job simply by blowing out all lines with carbon dioxide. In this connection, of course, it will be important not to get an extremely high pressure in the evaporators as it might cause the evaporators to blow up.

Your suggestion of putting loops in each line should work out all right except for the possibility that if one line was plugged while the others were open, the carbon dioxide might pass through the open lines without opening the plugged lines. If in this loop which is installed in each cabinet you installed a hand valve and then opened one valve at a time, blowing through from the main liquid line, then you would insure that the carbon dioxide had passed through all the lines and this would be a pretty thorough method of blowing out the dirt and also the moisture.

It has been my experience that whereas carbon tetrachloride is a very good solvent for many kinds of dirt, it does not clean carbon out as well as xylene and I would suggest that xylene be forced through the lines rather than carbon tetrachloride or methanol. I doubt if it would be necessary to pass any F-12 through the system after cleaning the lines out in the method indicated. I would also make doubly sure by installing a fair sized drier in the liquid line and if a drier using zinc moss or calcium oxide or activated alumina is used, it is quite satisfactory to leave the drier in the line permanently. Where you think there may be any possibility of not having all the moisture out of the system, a calcium chloride drier installed in the suction line for a few days is an added protection. It will be advisable, of course, to check all connections in the old tubing for possible leaks, especially in the suction lines.

I am sure that any system cleaned out in such a manner and charged with fresh sulphur dioxide should not cause any further trouble unless further leaks develop.

QUESTIONS ON GENERAL ELECTRIC HERMETIC

QUESTION 183. *In the article in your* REFRIGERATION SERVICE ENGINEER *on G.E. units —we have some G.E. units apart now, but*

can't find a suitable solution to clean inside of dome. These motors have been burned out, making a sticky composition inside. In the article, it tells to use some certain kind of a solution. Just what kind is this? Will appreciate any help you will give us on this.

ANSWER: There is a product manufactured under the trade name of Test X. This product is manufactured by the Oakite Products Co. *Use As Follows:* Four pounds in every ten gallons of water; bring this solution to a boil, then immerse dome or compressor part to be cleaned. Care should be taken not to leave articles in solution too long as it tends to produce a rough condition on copper if left too long. You may subject any part of the condensing unit with the exception of the switch or electrical parts, such as capacitors, wires or heater coils. Also, do not attempt to clean porcelain in this manner as the heat will cause it to flake off.

In some cases, the residue remaining after the motor burns out contains a very small percentage of carbon. After immersion, often the substance will leave the part only partially. This is dependent upon the amount of agitation. It is always possible to wipe this from the part as there is not a dissolvent for carbon, and it will remain on part being cleaned. Rub lightly with steel wool to remove. Do not use cloth as the lint will stick to the part and sometimes clogs the oil screen. Always thoroughly rinse all parts which have been washed in this solution, preferably with clean warm water. Always bring water to a boil and keep at boiling point while article is being cleaned. Agitate water as much as possible as it washes away, and above all, once a job has been cleaned by this method, be sure and dehydrate thoroughly.

QUESTION 184. *Since new ceramic leads can be purchased, we are interested in obtaining information as to where we can buy them. We also find that you suggest that silver solder by the name of Easy Flow melts several hundred degrees under the solder we are now using. We will appreciate knowing where this can be purchased.*

ANSWER: Ceramic leads can be purchased from the J. J. Skelly Co., 2015 E. 65th St., Cleveland, Ohio. These plugs are made of blue porcelain, and not glass as the original, and are much superior. They have a 1000 lb. pressure test, with 30000 volts at ¼ milliampere to ground test. Also, caution must be exercised in welding these units back together, starting the weld right by the plugs and covering the outside end of the plugs with a handful of wet asbestos. This prevents the porcelain from cracking and dirt settling in cracks and causing shorts.

Easy Flow solder can be obtained from the Steel Sales Corp., 129 S. Jefferson St., Chicago, Ill.

QUESTION 185. *I have two G. E. domestic refrigerators to fix which are giving me trouble. They are about 5 or 6 years old with monitor tops and porcelain evaporators. They run too much and the bottom of the evaporator is all that frosts up. I have added SO_2 and purged, but to no avail. During the off period, there is a continual rumbling boiling sound in the evaporator. I think it is oil logged. How would it be to turn the whole unit upside down and run it for awhile, or would you advise to heat the evaporator?*

Where is the heating element that keeps the oil warm? I've taken the name plate off, but couldn't find anything but a rubber plug. Any information you can give me on these jobs will be greatly appreciated.

ANSWER: As indicated by the question, there is a possibility of several things being wrong with these units. You speak of a boiling noise in the evaporator. This would tend to indicate that the liquid is acting and should frost. If there were no boiling noise, it would show that the evaporator was under pressure and, of course, the temperature of the evaporator would not lower. If you believe the evaporator to be oil logged and therefore add SO_2 of sufficient quantities, the oil will rise to the suction line and be returned to the compressor. Another possibility is that the suction line is obstructed with scale. Also, the brine level in evaporator, if of this type, is low. If so, remove small plug in back of evaporator and refill. I believe the best way to add gas to this system now is to purge off all the gas in the system and replace quantity as specified in manual, adding 10% of oil with gas at time of charge.

Heating element is located in back of rubber plug. Remove this plug and you will find a pair of wires just in back of plug. Be careful not to injure these wires. Pull them out and you will find heater unit coil attached to one end. This coil slips in to recessed opening in base of compressor.

QUESTION 186. *I have just read your first article on Field Service on G. E. Hermetic Units. This on my part is indeed most interesting and appreciated. It happens that just at this time, I am rebuilding one of the large G. E. units, and am having a little trouble in obtaining the proper replacement capacitor for the unit.*

The unit referred to is the type D-40 A16, the control used is type CR1050, and the capacitor used on this unit bears the number Y-2029-B with the code letters EH directly under this number.

In opening the unit, I found that the motor had been burned out due directly to excessive amount of sludge formation and moisture sticking in the pistons. The motor was rewound and replaced onto the compressor assembly, but failed to work. Further check proved that the capacitor was damaged. At this point, I made a trip to a large city to get a replacement capacitor and the G. E. company there supplied me with a capacitor No. 9AC25A1 with the code letters EJ directly under this number. This capacitor was hooked up and would not operate the motor. In checking further with the G. E. company, they were unable to give me any information whatsoever on the original capacitor used on this unit; therefore, I proceeded to take the old one apart. Observing the construction very carefully, I was able to rewind the transformer, but the condenser block was badly damaged, and this made it impossible to check the M.F.D. capacity of either of the sections of the condenser block.

Naturally, I figured that the total capacity would be about 100 M.F.D. and I proceeded to experiment with that amount capacity on the transformer. This resulted in the motor running, but only for a few minutes, and it would overheat and throw the thermal relay. Continued trials proved that the unit would run very nicely with three 95 M.F.D. condensers hooked in series, and with this hook-up, I ran the unit for several hours, but it heated too much.

This being the first G. E. unit I have ever opened and the first in this area, I will say I am having a lot of fun working with it. All of my competitors say it is absolutely impossible to do this job outside of the G. E. factory; therefore, that puts me on the spot in their opinion.

The compressor came out in good shape, and will pump and hold a vacuum of between 25 and 28 inches. My only handicap now is in obtaining the proper capacity for the transformer, and after seeing your current article, I am wondering if you have any information on the above unit.

Also, I would like to know if the "Locking Screw" referred to in the paragraph on Float Valves is not the Bristol Set Screw and shown as number 5 in Fig. 1 on page 8?

Having had several years' experience on all types of conventionally built units, I cannot see why it would be such a difficult job to completely rebuild any hermetic unit in any fairly well-equipped shop.

If it will not cause you too much trouble and inconvenience, I will surely appreciate any data concerning the unit I am working on, provided you have same. If you do not have this information, I will be very thankful to know where to write for it. Will the G. E. company release such data?

ANSWER: Regarding capacitor replacement for Y-2029-B for D-40 unit, in checking my records, I find the G. E. parts specifications show that the capacitor No. 9 AC 25 A is to be used on 110 volts, 60 cycle, and that 9 AC 24 A is to be used on 110 volts, 50 cycle.

With reference to the mfd. capacity of the condenser block, all of these blocks that I have ever checked, I have found to consist of either four or six condensers hooked together to develop approximately 16 mfd. Undoubtedly, in your test with a 100-95 mfd. condenser, they would only develop a few hundred volts. There should be at least 1,000 volts breakdown to handle this job. You speak of your compressor as being in good shape, and I am glad to find that true and wish you success.

The locking screw is a Bristol Set Screw, but of special design.

NEW MECHANICAL DEVICES
Service Tools and Special Equipment

Under this heading there will be published illustrated descriptions of new or improved service tools and equipment for the Service Engineer. Information contained in this department is furnished by the manufacturer of the article described and is not to be construed as the opinion of the Editor.

NEW CONTROL FOR COMMERCIAL INSTALLATIONS

A NEW stainless steel, corrosion-proof thermostat for general commercial use in pressure and temperature control, that is said to offer distinct advantages in accuracy, capacity, dependability and adaptability, has recently been placed on the market by Ranco, Inc., Columbus, Ohio.

The unit, Ranco Type "KO," is small and compact, requiring a mounting space of only

NEW RANCO COMMERCIAL CONTROL.

$4\frac{1}{16}$x$4\frac{1}{4}$x$1\frac{7}{8}$ inches, yet having the high electrical rating of ¾ h.p.—110 to 220 V., a-c. and ⅓ h.p.—115 V., d-c. The high rating is made possible because of the wide break which occurs when the overload trips or when the manual switch is operated—and because of heavy contact pressures and liberal contact surfaces of fine silver.

In addition to the high electrical capacity for this compact control, the manufacturers point out that it has an exceptionally wide range and differential adjustment. The temperature differential ranges from 4° to 20°. The low pressure differential ranges from 4 to 30 lbs. The high pressure differential of 30 lbs. is non-adjustable. The low pressure cut-out has a range of 20 to 40 lbs., the high pressure 110 to 200 lbs. For the temperature cut-out, ranges of —15° to 20°; 0° to 35° and 25° to 55° are available. The range calibration indicator is visible through a window covered with transparent material which excludes dust.

Both range and differential are adjustable from the outside of the switch.

Low-pressure and temperature controls normally are circuit-closing at high pressures and temperatures, but may be constructed to open the circuit on high pressures and temperatures. The high pressure cut-out is circuit-opening on high pressures.

The Ranco control mounts in any position with complete accessibility provided by easily removable snap-locking side covers. The knife edges of all toggle bearings are machined to assure extreme accuracy and long life.

Rotatable power elements on all pressure type controls simplifies tube connections. If desired, the angle fitting may be turned to point directly into the tube.

The thermostat is recommended by its manufacturers for milk coolers, walk-in coolers, display cases, water coolers, air conditioning installations, unit heaters and commercial service generally.

Bulletin fully describing this new Ranco "KO" Control will be mailed on request by the manufacturers, Ranco, Inc., Columbus, Ohio.

* * *

William J. Grant,
New Jersey.

This is the most valuable book on the market explaining refrigeration today.

VIRGINIA SMELTING REPRESENTED IN PEORIA, ILL.

THE Marquette Equipment Co., Oak and Washington Sts., Peoria, Ill., has succeeded the Isaac Walker Hardware Co. as the representative of the Virginia Smelting Co., in the sale of its Extra Dry Esotoo and V-Meth-L in the Peoria territory.

The new company has the same personnel as the old Isaac Walker Hardware Co., Mr. R. J. Swann, head of the old organization, being President of the new concern.

The new company will continue to operate as exclusive distributors for the Virginia Smelting Co.'s Extra Dry Esotoo and V-Meth-L.

MANUFACTURERS "THERMO" FIN COIL

THE Manufacturers Fin Coil Company of Chicago, Illinois, has just put on the market a new "Thermo" Fin in tube coil.

The "Thermo" Fin inside the tube of the coil is supplied with blades which are perforated so as to allow an unrestricted flow

"THERMO" FIN COIL.

of the refrigerant being used, and to break up any oil film which heretofore adhered to the inner wall of the tube of the coil, thus increasing the rate of heat transfer to a maximum. These blades are turned a predetermined amount so that the refrigerant is directed toward the entire inner wall which produces a washing effect. In addition the "Thermo" Fin in the tube adds to the effective surface of the coil.

The Manufacturers Fin Coil Co. has just issued an elaborate catalog which will be sent to interested persons upon writing to them direct.

NEW CHICAGO PARTS JOBBER

IT WILL be of interest to all refrigeration service engineers to learn that the Automatic Heating and Cooling Supply Company, of Chicago, Illinois, has just opened a large store and warehouse at 647 Lake St., wherein they will carry at all times complete stocks of standard refrigeration parts for the refrigeration service engineer, as well as full stocks of refrigeration equipment for large refrigeration, cold storage and air conditioning installations.

Mr. William F. Hauber, who formerly was connected with the Steel Sales Corporation, Chicago, agents for Mueller Brass Company and Wolverine Tube Company, will be sales manager of the firm.

When interviewed, Mr. Hauber stated: "It will be the aim of the Automatic Heating and Cooling Supply Company to carry in stock at all times a complete line of refrigeration equipment and we will see to it that a 24 hour service will be given to our customers. The policy of the firm will be to sell to refrigeration service engineers, and air conditioning contractors only and to protect their interests in every possible way."

This firm is about to publish an extensive catalog, which will be sent to any refrigeration service engineer or air conditioning contractor upon request.

A. W. MONROE, DIVISIONAL MANAGER, WILLIAMS ICE-O-MATIC

MR. A. W. MONROE has been appointed Divisional Manager of Williams Ice-O-Matic Co., of Bloomington, Ill., with Chicago offices at 1734 W. 107th St.

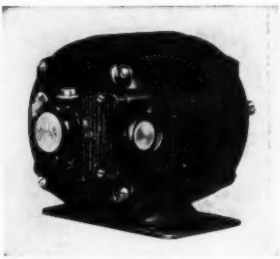
Mr. Monroe will cover the territory formerly handled by Mr. H. P. Wasson, resigned.

NEW G-E "THERMO-TECTOR" FOR FRACTIONAL HP MOTORS

A NEW thermal overload switch for fractional horsepower motors, operating on line current and arranged for convenient mounting on the conduit or terminal box of the motor, has recently been placed on the market by the General Electric Company, Schenectady, N. Y. It is completely self-contained and has no links or plugs to be replaced.

Known as the "Thermo-Tector," the device automatically disconnects the motor from the line, when an overload occurs, before the

motor reaches a dangerous temperature. Then, when the motor has cooled, it is automatically reconnected to the line, the entire operation being repeated at a safe interval until the motor is freed of overload or is removed from the line.



NEW G. E. PROTECTOR FOR FRACTIONAL MOTORS.

Where the automatic-reset feature is not required, a form of the new switch is available which can be used to disconnect the motor from the line and leave it disconnected until the device is manually reset.

The elements of the switch consist of a thermostatic bimetallic helix, a heater helix, a flat steel spring, and a contact arm. The bimetallic helix is fixed at one end. The opposite end carries a slotted arm which rotates about one support of the spring. A low-resistance heater, which is connected in series with the motor winding and which carries the motor current, completely surrounds the bimetallic helix. This heater element is welded in place and is tamperproof. The flat steel spring is mounted between two rigid supports in such a manner that it is slightly bowed. This bowed spring carries a contact arm which makes contact when the spring is bowed in one direction, but which opens the circuit when it is bowed in the other direction.

When the bimetallic helix is heated to a temperature above normal, the free end rotates and reverses the bow of the spring. When the spring passes dead center, it also moves the contact arm and disconnects the motor from the line. With the line open, current ceases to flow in the heater helix, the bimetallic helix turns in the opposite direction, and when the temperature is again normal, the spring snaps to the "on" position.

The Thermo-Tector is available in ratings for a.c. fractional-horsepower motors having rated full-load currents from 1.3 to 10.4 amperes.

KELVINATOR SERVICE DEPARTMENT TO COOPERATE WITH PUBLIC UTILITIES

TO coordinate the activities of the Service Department with the specific requirements of the public utilities, George Thompson has been appointed Special Assistant to E. A. Seibert, Director of Service, for Kelvinator Division of Nash-Kelvinator Corporation. The Service Department consists of 30 men trained and experienced in the household field. They will be available to render assistance to operating companies throughout the country. This activity will assure to the public utility customers the ultimate in service derived from Kelvinator products.

NEW CATALOG ON GASKETS ISSUED BY CHICAGO-WILCOX MFG. CO.

ONE of the most complete catalogs on what might be considered a small item, but a mighty important one, is the new gasket catalog recently issued by Chicago-Wilcox. It is a standard 8½ x 11 size, con-

GASKET CATALOG OF CHICAGO-WILCOX.

taining some 54 pages of printed matter, and from its attractive and substantially bound cover to the last page, it is a complete illustrated manual on replacement gaskets for every well-known make of machine. Chicago-Wilcox replacement gaskets have been made to the material specifications of the designers of the original equipment.

The catalog points out that it was back in 1919, in the early pioneer days of refrigera-

tion, that Chicago-Wilcox started in the manufacture of gaskets for refrigeration service, and during the intervening years, developments were accomplished in the type of material from which gaskets were made so as to resist the action of the various refrigerants as they were introduced into the field.

This catalog, which is No. 30, is bound in loose-leaf fashion so that additional sheets, as they are issued from time to time, may be included.

ROTARY SEAL REPLACES STOCKS IN FLOODED AREA

THE Rotary Seal Co., of Chicago, Ill., has made a general announcement to their jobbers in the affected flooded area that any Rotary Seal replacement units or seal cartons in stock, which were injured or ruined because of flood conditions, may be returned to the company, and they will be replaced with new stock at no cost.

This arrangement is based on the same offer made during the flood conditions which prevailed in the Pittsburgh area in 1936.

THE FREEZERETTE FOR THE REFRIGERATOR

IF our grandparents could have foreseen the development in refrigeration, they could hardly have imagined a modern refrigerator of today and all of the many things that go into this refrigerator for the convenience and comfort of the home. Many important accessories have been built for the refrigerator for the convenience of the housewife, and now comes one of the latest and newest things in a unit called the "Freezerette." The "Freezerette" is nothing more or less than a skeleton anodized aluminum tray or holder for five beautiful individual crystal glass jars made to conform and fit to this holder and tray, and holding four ounces each. They are used for the freezing of sherbets, ice box ices, ice cream, real iced tea cubes, iced coffee cubes for cooling the iced coffee and the iced tea, and keeping the full flavor instead of cooling it with the regular ice in the summer time, or for making jellos and aspics, all of which delicious delicacies and ices are served from these little individual jars on a little serving plate at the table.

The "Freezerette" is made in two sizes—one is ten inches long for the smaller refrigerators which have a shallow freezing zone and accommodate four of the four-ounce jars, and the other is for larger refrigerators that have a freezing zone twelve inches in depth and accommodate five of the four-ounce jars. It is said that this item is meeting with much favor by the public because of the ultra modern convenience offered in the use of these jars. As anyone knows who has made ice cream by freezing it in the ordinary trays, it cannot be done very satisfactorily. It is said that with the little "Freezerette" jars the mixture is first allowed to set in an ordinary bowl in the refrigerator, chilling it for about thirty minutes. It is then taken out of the bowl where it was placed to chill and again thoroughly beaten. It is then placed in the ordinary ice tray and allowed to set for about thirty minutes to chill again. It is now taken out of the ordinary tray, and your whipped cream or whatever you desire is added and the entire mixture is thoroughly beaten and then poured into the "Freezerette" jars and placed in refrigerator for final freezing, which usually requires about two and one-half hours, depending upon the refrigerator. The contents are then well frozen and the "Freezerette" jars are taken from the tray, placed on a serving plate and served at the table.

These jars are also fine to chill puddings and innumerable other things which are prepared in this way, such as cold consommes, etc.

This item retails at $1.00 and $1.25. Replacement jars can be purchased at 10 cents each.

AIRO SUPPLY MOVES

TO permit necessary expansion and to provide for greatly increased stock, Airo Supply Company, wholesale refrigeration and air conditioning jobbers, has leased for a number of years an entire building at 2726-32 North Ashland Avenue, Chicago. The purchasing department and general offices are at 2726 No. Ashland Ave., and the store at 2732 No. Ashland Ave.

The site was selected due to the easy accessibility of this point to all parts of Chicago, being just a few minutes drive from the loop and located on Ashland Avenue, a main north and south thoroughfare.

All departments have been enlarged and much new equipment is being obtained to make pleasant working conditions for all employes and to increase efficiency. All departments are lighted by daylight as the entire building is surrounded by windows.

VIEWS AND REVIEWS

By HERMAN GOLDBERG

THERE has always been a question in my mind as to what actually makes a smart business man. I have always wondered how certain individuals stay in business and why certain others just do not seem able to make the grade.

From my own observations I think that there are always numerous business men who seem to have the faculty of making mistakes at the right time to their profit, and others who appear to do the right thing always at the wrong time with opposite effects.

During the past few years a tremendous number of very fine business men have become bewildered because of the failure of their established policies, and because certain competitors of theirs apparently have progressed tremendously by using honest but unorthodox methods.

All of the above leads to the business houses which were on a substantial basis prior to the depression, and who suddenly found themselves in difficulties because of failures of their affiliated sources of supply, and, of course, falling off of customers.

I believe we will find that our good judgment which may have proven wrong during the bad times, under the circumstances which we are facing today, will prove right. In other words, some of our decisions which fell through three years ago when conditions were against them, may prove very valuable today when there are better circumstances.

Speaking of successes, Chicago Chapter wishes to broadcast the fact that as early as this date, the 1937 convention which will be held in this city, is going to be in a class by itself.

COPELAND ADDS DOMESTIC APPLIANCES TO LINE

TWO well-known names in the household appliance field were brought together under one management with the purchase of the Prima Manufacturing Company of Sidney, O., makers of electric washers and ironers, by Dallas E. Winslow, Inc., of Detroit, which is identified with the Copeland Refrigeration Corporation of Detroit.

The acquisition of the Prima company gives the Winslow company a well-rounded line of domestic appliances with which to undertake its recently announced program of expansion in this field.

"By joining these two long-established lines of products under one aggressive, well-organized sales management, we believe that we can bring about a big increase in volume during 1937 for these two companies," stated Mr. Dallas E. Winslow, president of the Winslow organization.

"We already have made great progress in expanding the factory and field sales organization for the purpose of developing sales of Copeland household and commercial refrigeration. Now, with the addition of the Prima line, we are in a position to offer distributors and dealers an even more attractive marketing proposition.

"We are going to support the development of sales of the complete line of refrigerators, washers and ironers with a campaign of national and local advertising."

While manufacture of the two lines will be continued separately in the Copeland plant at Detroit and the Prima plant at Sidney, O., the sales forces for the two lines will be combined under the direction of Mr. James D. McLeod, general sales manager of the Copeland Refrigeration Corporation. Associated with Mr. McLeod in charge of the Prima division will be Mr. Charles H. Collies, who has been in charge of Prima sales during the past two years, while Mr. W. G. von Meyer, long identified with Copeland, will head the Copeland sales division.

For 1937, Copeland, who is a pioneer in the electric refrigeration field, is completing its line with the addition of new sizes of household refrigerators, ranging from four-foot to nine-foot capacity, and will continue its complete range of commercial units.

SERVICEMAN DISPLAYS ARTISTIC ABILITY

IT TOOK Nelson D. Wagener, of Wagener Refrigeration Service, Butler, Pa., a member of the Pittsburgh Chapter of the R. S. E. S., to fabricate (as was described by the local newspaper) the most unusual Christmas tree in the world.

Mr. Wagener conceived the idea that what could be more appropriate than a refrigerated tree, and so he proceeded to do an artistic job with copper tubing, constructing a tree approximately four feet in height,

which was on display during the Holidays. It made a most unusual effect when the copper tubing started to frost, particularly at night when green and blue lights cast a colorful glow on Mr. Wagener's creation. Not only was he successful in securing an effective display for his window, but received additional publicity through the newspaper.

Here is an idea that can be filed away for next Christmas, and when the servicing business shows a lull, think about producing a Christmas tree in copper tubing.

S S S

WRENCHES IN THE REFRIGERATING PLANT

SEVERAL times I have seen the "kink" in print which shows how to make a wrench longer by "slipping a gas pipe over." It is a very simple procedure and it may look and sound good to some refrigerating mechanics, but I don't believe in making a wrench longer in order to put nuts on tighter.

As you doubtless have observed, wrenches for small nuts are invariably short; for medium nuts, medium in length; and for large nuts, they are long. The manufacturers therefore seem to have some "system" in making wrench lengths, and they have. The pitch of the thread is considered, the cross-sectional area of the bolt at the bottom of the threads is considered, and the strength of the average man who does the tightening is also considered.

To make a wrench "twice as long" you therefore increase the tension on the bolts to twice the amount, the force of pull on the wrench being the same. By increasing wrench lengths, I have frequently actually "stretched" bolts until they broke in two, or I stopped turning as soon as I felt the bolt begin to stretch. This is poor practice, and I do not do it any more. I do not increase the wrench's length any more because I realize that the elastic limit of a bolt should never be reached.

If you feel like making a wrench longer for "unscrewing" a nut—all right. But don't make it longer for tightening; you may thereby ruin a valuable piece of refrigerating equipment and may even cause a serious accident.—S. W. F.

S S S

IDEAL COMMUTATOR BUYS MARSHALL ELECTRIC

THE Ideal Commutator Dresser Company, 1093 Park Avenue, Sycamore, Illinois, manufacturers of quality electrical products, announce the acquisition of the Marshall Electric Company of Elkhart, Indiana, manufacturers of Automatic Regulators for voltage, current and speed control of electrical equipment. The plant of the Marshall Electric Company at Elkhart is the only one of its kind devoted to the manufacture of Automatic Voltage Regulators.

Operations of the acquired company will be transferred as rapidly as possible to Sycamore and consolidated with the main office, production, engineering, research and development departments of the Ideal Commutator Dresser Company. The Marshall Electric Company is an old, established concern, which occupies a leading position in the field of Automatic Voltage, Current and Speed Control Regulating Equipment.

The REFRIGERATION SERVICE ENGINEER

A Monthly Illustrated Journal, Devoted to the Interests of the Engineer Servicing Refrigeration Units, Oil Burners and other Household Equipment.

Vol. 5 February, 1937 No. 2

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REFRIGERATION SERVICE ENGINEERS' SOCIETY

SOME GOOD POINTERS ON BUSINESS ADMINISTRATION

SOME very pertinent reasons why dealers fail, and practical suggestions for succeeding, are laid down by Frank W. Greusel, president, Greusel Distributing Co., Milwaukee, Wisc., distributor of Crosley Shelvador electric refrigerators, in a bulletin recently issued to the trade in Wisconsin by the Wisconsin Radio, Refrigeration & Appliance Association, of which Mr. Greusel is president and an active leader.

While his talk was addressed particularly to refrigerator distributors, there is much sound logic that can be applied to the refrigeration servicing business, so we publish his comments.

Mr. Greusel deals out some sound information and advice on competition, advertising, cooperation, budgeting and other factors necessary to business success.

To begin with he says, "Generally speaking, there is no such thing as 'outsmarting' your competitor, and 99% of the time no one person or firm has any advantage in business over the other. Why not, therefore, secure your reasonable or proper share of the available business at a margin of profit that returns to you just what you are entitled to—with less worry, less work and more friends and improved relationship throughout the trade?" he asks significantly.

"If competition has had you hypnotized," he says, "come out from under the spell. Listen to this—Dun and Bradstreet prove by careful analysis that competition causes only 2.6% of all business failures. Incompetency and lack of capital cause 79.3%. Don't worry any longer about competition. Get acquainted with your competitor—with all of your competitors. The first surprise you will get is that you will find yourself liking him. The next thing that will happen is that you will learn something from him. Many of us have inferiority complexes. We have that same feeling that sweeps over a bank robber when he gets his check in a night club. Overcome this feeling by becoming the alert, mental equal of your competitor."

Lack of Experience

Pointing out that lack of experience and lack of capital are responsible for about 80% of dealer mortality, he urges dealers to establish a budget and calls attention to the fact that the local banks have competent accountants who are glad to have the opportunity to help in this matter.

"Your banker is always a good man to turn to for advice and counsel in establishing a budget. Most banks have capable accountants who are only too anxious to serve their clients on matters of this kind. I recently suggested to one of our dealers that he interview his banker regarding the conditions of his affairs, which at the time appeared to be 'badly frozen' and I was surprised at his lack of enthusiasm, as he quoted rather flippantly *his* definition of a banker. 'A banker is a man who loans you an umbrella when the sun is shining, but takes it away when it starts raining.' I do not subscribe to his sentiment. His affairs were apparently too scrambled to be presented to the banker. It is disappointing to know that altogether too few merchants can secure aid and accommodations from a bank, as I am certain that most any bank will aid a merchant that does business on a budget basis and who keeps an accurate set of books which honestly reflect his true condition.

REFRIGERATION SERVICE ENGINEERS' SOCIETY

Official Announcements of the activities of the National Society and Local Chapters appear in this department as well as articles pertaining to the educational work of the Society.

THE OBJECTS OF THE SOCIETY

To further the education and elevation of its members in the art and science of refrigeration engineering; for the reading and discussion of appropriate papers and lectures; the preparation and distribution among the membership of useful and practical information concerning the design, construction, operation and servicing of refrigerating machinery.

ASSOCIATION HEADQUARTERS: 433-435 North Waller Ave., CHICAGO, ILL.

KANSAS CITY CHAPTER

Meeting of January 12, 1937

By R. E. Kingsolver, *Secretary*
3830 Woodland St., Kansas City, Mo.

THE meeting was called to order by First Vice-President H. L. Green in the absence of President Roy Cox. Mr. Cox has left Kansas City for the west coast and is not expected to return.

The report of the open meeting of November 25th and report of the convention as well as the minutes of the Board of Directors' meeting of December 16th were read and approved.

The Treasurer's report was read and is to be approved after an audit.

Election of officers followed, and the following members were elected to serve their respective offices for 1937 as follows: H. L. Green, *president;* T. L. Anderson, *first vice-president;* J. P. DeWilde, *second vice-president;* R. E. Kingsolver, *secretary;* H. F. Andrews, *treasurer;* A. L. Sullivan, *sergeant-at-arms;* S. A. Leitner, *board of directors.* (A motion was made and seconded that the two remaining directors be elected at a later date.)

Mr. Don Ransdell, the flying service man from Kansas, was called on to say a few words.

✕ ✕ ✕

James W. Perkis,
Illinois.

Your magazine is the tops in the refrigeration service field. Its issues are both an education and an enjoyment.

CINCINNATI CHAPTER

Meeting of January 8, 1937

By M. J. Kummler, *Secretary*
4261 Spring Grove Ave., Cincinnati, Ohio

PRESIDENT R. B. HOWARD read letters and literature from the national office, containing plans and ideas for securing new members. Secretary Kummler was instructed to obtain reprints of the "Benefits of Association" for prospective members. Open discussion followed on how to secure new members, and the members present agreed to each make personal contact with two men who are not yet members of the chapter.

Motion was made, seconded and carried, that the secretary-treasurer's office be split, and the new treasurer will be elected at the February meeting.

Representatives of the Mueller Brass Company gave a very interesting lecture on refrigeration equipment and fittings, and Mr. Bud Hill of that company gave a demonstration on the art of sweating streamline fittings.

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TWIN CITIES CHAPTER

Meeting of January 12, 1937

By J. Samways, *Secretary*
3015 Clinton Ave. S., Minneapolis, Minn.

THE Twin Cities Chapter held its annual meeting on Tuesday, January 12th, at its meeting room at the Midway Y. M. C. A.

Election of officers for 1937 took place, and the following were elected: A. E. Johansen, *president;* A. G. Larson, *first vice-president;* H. E. Schaeffer, *second vice-president;* J. Samways, *secretary;* A. M. Palen,

treasurer; J. D. Stewart, *sergeant-at-arms;* C. F. Kirk, W. V. Warner and C. E. Tupper, *board of directors;* E. T. Swedberg, *educational chairman.*

S S S

YOUNGSTOWN CHAPTER

Meeting of January 11, 1937

By **Martin Bokesch, Jr.,** *Secretary*
R. F. D. 5, Youngstown, Ohio

PRESIDENT Roy Keith called the meeting to order, with roll call of officers and members following. The Secretary's minutes of the previous meeting were accepted as read, as was the Treasurer's report.

Mr. Bokesch, Sr., reported that the special committee on licensing had not as yet had a meeting.

Motion was made and accepted to propose the formation of a state chapter.

It was moved and carried to leave the matter of re-instatement of delinquent members to the Board of Directors.

Correspondence from National Secretary McDermott and Mr. James Downs was read.

Messrs. Davies and Aigler, the delegates on licensing, were instructed to take the stand to license contractors, service men and installers.

The membership voted to do without a Nominating Committee, and the following officers were elected to serve for 1937: Martin Bokesch, Sr., *president;* Mills Remaley, *vice-president;* Roy Keith, *treasurer;* Martin Bokesch, Jr., *secretary;* Reese Davies, *sergeant-at-arms;* W. Kimball, J. D. Nutt and

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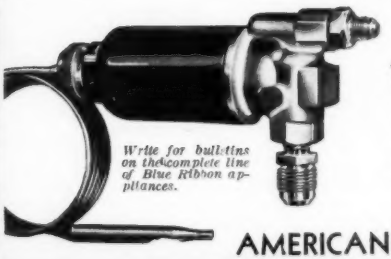

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G. C. Aigler, *board of directors;* Charles Eich, *educational chairman.*

President Keith left the chair with a speech in which he thanked the members for their splendid cooperation during his term and wished the new President the best of luck in the coming year.

President-elect Bokesch took the chair and thanked the members for the honor they had conferred upon him. He asked the members for their full cooperation to help make the next year a memorable one.

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PITTSBURGH CHAPTER

Meeting of January 11, 1937

By F. V. Golitz, *Secretary*
1518 Davis Ave., Pittsburgh, Pa.

THE regular January meeting of Pittsburgh Chapter was held in the Commonwealth Building, with Mr. C. O. McCauley presiding. Forty members and visitors were present.

Motion was made by Mr. Ricci and seconded by Mr. Zidar that the regular order of business be deferred to receive the report of the Nominating Committee. The chairman, G. W. Gunnell, and the tellers reported the election of the following: John Kirch, *president;* E. V. Black, *vice-president;* V. C. Waight, *treasurer;* F. V. Golitz, *secretary;* John Barbagallo, M. F. Gross and H. S. McCloud, *board of directors.*

The elected officers were congratulated by Mr. McCauley, and he pledged his cooperation for the betterment of the Society. Motion was made by Mr. Black and seconded by Mr. Gunnell that a vote of thanks be given Mr. McCauley for his performance of his duties as President for two terms. Motion carried.

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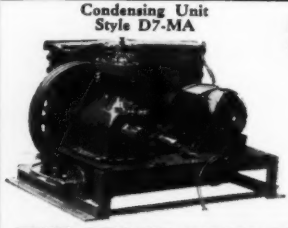

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Mr. Kirch introduced Mr. R. V. Clark of the Penn Switch Company, who first distributed a useful souvenir and then gave a talk and demonstration of Penn controls. Mr. Clark's talk was supplemented by an elaborate panel consisting of all the models of Penn controls in production. These controls were attached to a refrigeration system and were under actual operation. At the conclusion motion was made by Mr. Croston, seconded by Mr. Black, that a rising vote of thanks be given Mr. Clark for his splendid talk, which was carried and so ordered.

The visitors and non-members were excused and the business meeting was conducted.

Minutes of the December meeting were read by the Secretary and accepted. The Secretary read the correspondence and same was commented on.

It was moved by Mr. Barbagallo and seconded by Mr. Davidson that the Secretary have forty copies of the meeting notice blueprinted for posting on the bulletin boards of the parts distributors. Motion carried.

The Treasurer's report was read and accepted. The accounts and funds were turned over to the newly elected treasurer, Mr. V. C. Waight, by Mr. Ricci.

The subject of uniform rates was brought up and it was moved by Mr. Gross, seconded by Mr. Black, that the Secretary send to Cleveland Chapter for a copy of their Uniform Rate Book. Motion carried.

The application of Mr. A. R. Olmsted was then acted upon favorably by the Membership Committee, after which the meeting adjourned.

S S S

ST. LOUIS CHAPTER

Meeting of January 14, 1937

By E. A. Plesskott, *Secretary*
2145 67th St., St. Louis, Mo.

THE annual meeting of St. Louis Chapter was held on Thursday evening, January 14th, at the German House, and was called to order at 8:30 p. m. by President Plesskott.

It was decided to exhibit the talking motion pictures before going into our regular session, in order to enable those who due

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to the inclemency of the weather might be finding it difficult to arrive on time.

A very instructive sound picture, furnished us by G.M.C. and in charge of two of their operators, was well received by those present. A vote of thanks was given the G.M.C.

The minutes of our meeting of December 10th were read and approved. Correspondence from national headquarters, the St. Louis section of the A.S.R.E., and season's greetings from the various chapters, were read.

The annual report was given by President Plesskott.

Each member present having been supplied with a pad and pencil for the balloting of the officers for 1937, the work began in earnest.

The slate of the Nominating Committee was briefly discussed, and the officers elected were: E. Gygax, *president;* L. L. Vollman, *first vice-president;* O. Petri, *second vice-president;* E. A. Plesskott, *secretary-treasurer;* N. G. Ward, *sergeant-at-arms;* H. J. Nettler, W. L. Hart, and V. W. Flack, *board of directors;* O. G. Tinkey, *educational chairman.*

Mr. Gygax spoke briefly on plans he hoped to be able to carry through, thanked all for the honor bestowed upon him and wished all members to help make this our most successful year.

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In the new No. 313-C Dehydrator and its mate, the No. 314-C, the drier is contained in a refill cartridge which is made of brass with screen and felt at each end. The bolted end allows for quick change and when this end is put on the inlet side, the dirt and scale can be removed when replacement is made. Cartridges of activated aluminum, calcium chloride, or calcium oxide as specified . . . and then there is the Imperial flanged dehydrator furnished in various lengths with dispersion tube at the inlet end that assures even distribution of refrigerant . . . and another new development is the No. 31-C—one of the lowest priced dehydrators on the market. It is suitable for use on small systems and it is frequently left on as a permanent part of the system.

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Nos. 313-C and 314-C cartridge refill dehydrator with demountable flange

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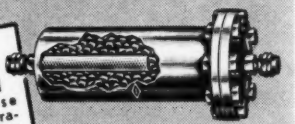


No. 385-C flanged dehydrator with dispersion tube

No. 31-C small dehydrator for permanent installation

IMPERIAL Dehydrators

ORDER FROM YOUR JOBBER

VALVES • FITTINGS • TOOLS • CHARGING LINES • STRAINERS • FLOATS

CHICAGO CHAPTER

Meeting of January 26, 1937

By Willis Stafford, *Secretary*
726 Hinman St., Aurora, Ill.

THE educational program was presented before the business session. Mr. Thorenson of the Insto-Gas Corporation demonstrated a new type of heating torch using propane, and being very economical to operate. In the second part of the program, Mr. Holmes of the Utilities Engineering Institute gave a very interesting and instructive talk on the use of the Psychrometric Chart.

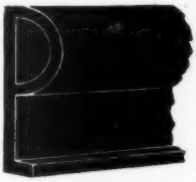
The first order of business in the business meeting was the presentation of the gavel by Fred Roth to the new President, Ivar Skipple.

Mr. R. Vanston gave his views regarding the educational program. He suggested that we take up the study of servicing air conditioning systems, such as setting controls, use of various instruments in temperature measurement, and general conditions that have to be corrected by a service man other than the ice machine itself.

President Skipple appointed Fred Roth as chairman of the Membership Committee. Mr. Roth asked the cooperation of the members in getting new faces in our group. He stated that we should have two hundred members by convention time.

There was some discussion on holding an extra meeting every month purely for educational purposes. Mr. Hendrickson stated that if the regular meetings were started on time a lot more could be accomplished. President Skipple suggested the members think it over before taking any action.

DOOR GASKETS



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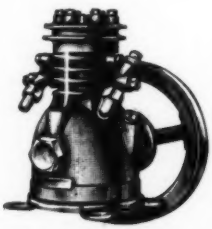

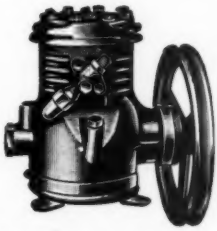

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COPELAND
REFRIGERATION CORPORATION
DETROIT, MICH.

MISSISSIPPI VALLEY CHAPTER

Meeting of January 22, 1937

By E. L. Bengston, *Secretary*
114 E. 1st St., Davenport, Iowa

THE meeting was opened by Mr. Harold J. McChesney, temporary chairman. He introduced the speaker of the evening, Mr. R. B. Barber of the Marathon Motor Mfg. Company, who gave a very interesting talk on capacitor type motors, and 25-cycle motors. He also stated that he would give the Society a motor which could be used as a door prize or whatever the members see fit to do with it. This motor, which will be a 1/6, 1/4 or 1/3-h.p. capacitor type, will be given us provided we have a 75% average attendance for three meetings after the chapter is organized. This offer was greatly appreciated by the members.

Mr. E. L. Bengston, secretary, read the minutes of the previous meeting after which Mr. Ed Dick made a motion, seconded by Mr. Teagarden, that the minutes be accepted as read and placed on file. Mr. Fred Tindall, treasurer, gave his report next. Mr. E. J. Ford made a motion that same be accepted and placed on file. Motion seconded by Mr. Stebbins.

Mr. Teagarden suggested that service men and engineers wanting to belong to the local organization, and who felt they could not pay the $5.00 in full should be allowed to pay $2.50 immediately and the remaining $2.50 in two months' time. Motion was so carried.

The Marshalltown Tri-Temp gauges and Kerotest testing outfit, given for the best name submitted to the organization, was won by Mr. E. J. Ford of Kewanee, Illinois. The name which Mr. Ford submitted was, "Mississippi Valley Chapter." As this name was submitted by two or three other members it was necessary to put them in a hat and draw. However, everyone was happy that Mr. Ford was the lucky man as he was the first person to hand in his application for membership in the Chapter, and all felt it fitting that he should have the winning name. Mr. Leonard Nelson made a motion that we accept the name, "Mississippi Valley Chapter" for our organization, and Mr. Stebbins seconded this motion. When the vote was called the members accepted this name unanimously.

Mr. Leonard Nelson made a motion, which

was seconded by Mr. Teagarden, that the charter be presented to the Mississippi Valley Chapter of the R.S.E.S. on Friday evening, February 12th, at which time a banquet is to be held at one of the local hotels. Each member is to be assessed fifty cents, and the balance of the expenses will be taken from the treasury.

S S S

PATENTED SERVICE VALVES FOR HERMETICS

IN the July, 1936, issue of THE REFRIGERATION SERVICE ENGINEER, page 19, appeared an article by Mr. L. K. Wright, describing and illustrating special service valves for hermetic units.

The publishers have received information that this valve has been patented under Beach Patent No. 1,848,691, which is being manufactured by the C-Y Manufacturing Co., 161-04 Eighty-Fourth Road, Jamaica, New York, who are operating under the above patent and claim to be the only authorized manufacturer of a valve of this character as referred to in the July issue.

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POSITION WANTED — Serviceman, age 33, married. Twelve years experience—installation and service of refrigeration equipment, all systems, refrigerants. Now employed six years same firm. Desires opportunity to assume responsibility. Go anywhere on reasonable notice. Initial salary secondary to future. References. Address Box 108, THE REFRIGERATION SERVICE ENGINEER, 435 N. Waller Ave., Chicago, Illinois.

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Complete Stocks Immediate Delivery
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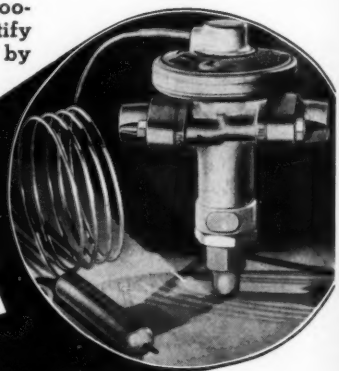

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AUTOMATIC PRODUCTS COMPANY

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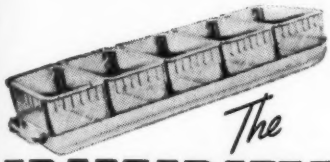

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The New Scurlock Freezerette

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It is made in two sizes, the smaller size four jars, ten inches in length—and the larger size five jars, twelve inches in length. You miss a great opportunity if you don't get immediate information on this, get your stock in, and get your share of the business. Address

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IS NOW IN PREPARATION

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SPECIALIZED TOOLS FOR REFRIGERATION SERVICE

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Available only through our own branch distributing warehouses located in 37 principal cities. See "Snap-on Tools, Inc.," in your telephone directory or send coupon.

R-200B SET. One piece forged ratchet with ¼" square opening for work on valve stems. 1½" extension, 2 adaptor plugs, 1 Kerotest valve packing nut socket, 5 square valve stem sockets, 5 packing gland nut sockets and 3 double-broached Ferret sockets. Complete in metal box

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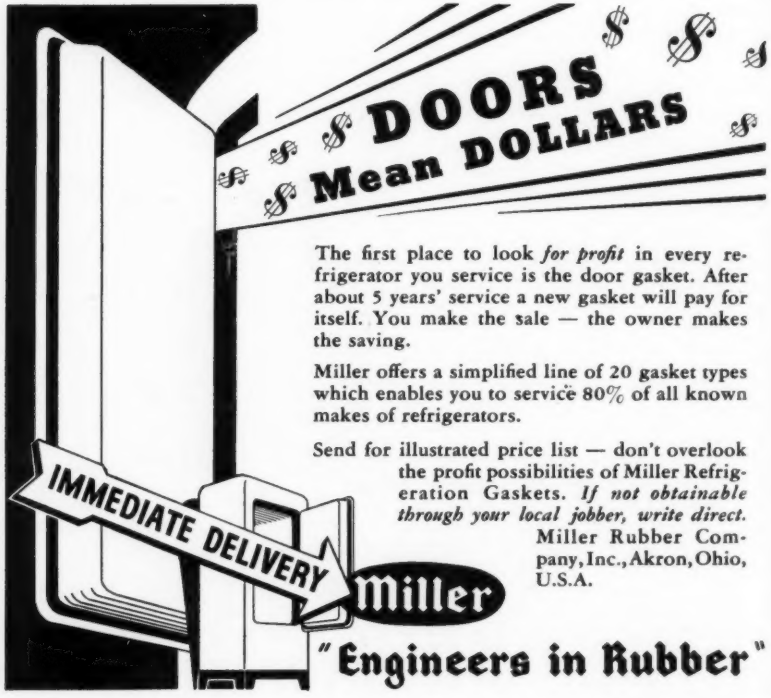

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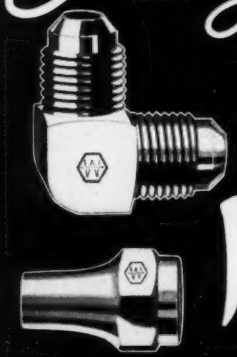

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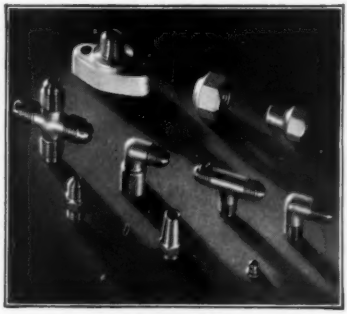

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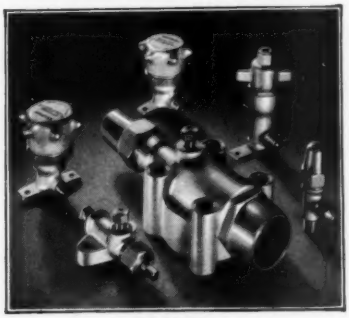

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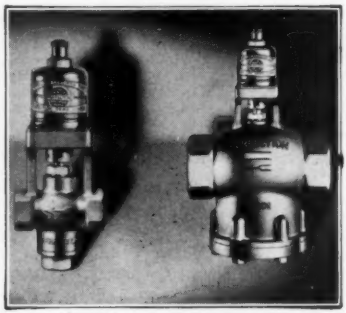

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